the OIL AND GAS JOURNAL
PUBLISHED WEEKLY AUGUST 28, 1961

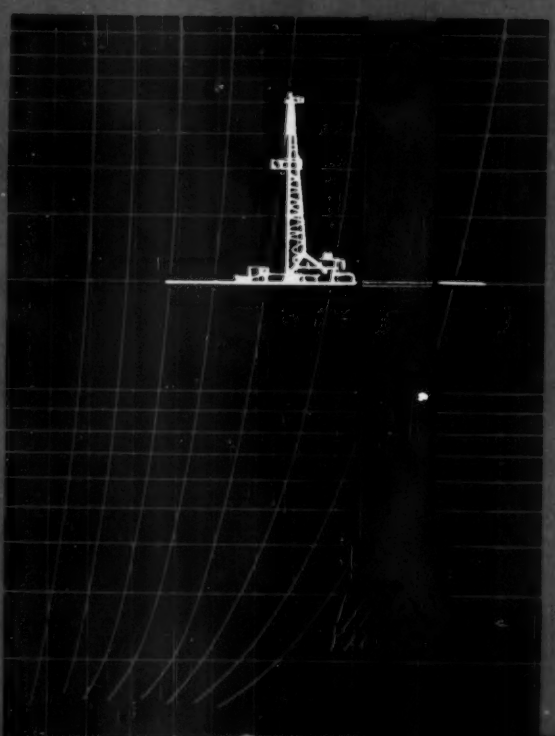
Oil's foreign spending to stay high ▸ 39

Propane stocks: New record every day ▸ 46

Russian gas could dominate Europe ▸ 58

Santa Ana: Mexico's No. 2 field? ▸ 80

NEW WAY TO FIGURE RATE OF RETURN ON DRILLING INVESTMENTS



p.86

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OIL AND GAS JOURNAL
Vol. 59, No. 35

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TECHNOLOGY—OPERATION

Refining-Processing

Lube Capacity Edging Up Slightly 66

by D. H. Stormont

A revised updated version of the NPRA survey shows that finished-lube capacity of U. S. refineries is tending to edge upward again after several years of holding steady.

How to Operate a Flare System Safely 73

by W. C. Bluhm

A review of accidents involving flare systems and what can be done to minimize them.

Processing Notes 78

Canada's latest gas-processing plant boasts many firsts—New chart integrator can serve several units simultaneously.

Questions on Technology 96

by W. L. Nelson

More on obsolescence costs.

Pipelining

Water Layer Speeds Heavy-Crude Flow 68

by M. E. Charles

How water as a bottom layer in a pipeline carrying viscous crude oil can reduce pressure gradients to one-tenth of those encountered in a line carrying such crude alone.

Drilling-Production

Santa Ana: Mexico's No. 2 Field? 80

by Carl Lawrence

Three permanent platforms will be working in field off Mexico by the end of the year. And a big mobile platform and a drill ship are busy punching down core holes to spot locations for other permanent platforms.

Are Your Lifting Efficiencies Below Par? 83

by F. L. Hart

Don't overlook the chance to improve efficiency in present oil-lifting equipment. Maybe systematic checking with sonic devices and dynamometers will bring about better performance.

Calculating Rate of Return of Oil and Gas Drilling Investment 86

by Hayward H. Hill

This method is applicable to projects having various combinations of constant and declining incomes and to various interest-compounding periods.

Reservoir Engineering—39 101

by E. T. Guerrero

How to find ultimate recovery and performance of oil reservoirs.

THE OIL AND GAS JOURNAL **Newsletter**

August 28, 1961

Significant this week

Oil companies have scheduled a high level of spending this year and next outside the U. S.

Department of Commerce study shows foreign spending will total more than $3.5 billion in 1961 and 1962. This is $500 million more than in 1959 and 1960, but less than in previous 2-year period.

Current figure is nearly a third of total expenditures planned by all U. S. industry abroad (p. 39).

There isn't likely to be a tanker strike at the end of the 80-day Taft-Hartley cooling-off period.

Marine engineers and tanker operators last week came to terms over major issue—bargaining rights on American-owned foreign-flag tankers.

Other agreements with various unions were still pending, but problems are expected to be settled.

Solution reached between engineers and operators provides for new contract, with bargaining-rights issue to be turned over to joint committee. If issue isn't resolved by February, union may then strike without violating new contract.

Cities Service earlier had taken a new tack to avoid union problems. It had sold one tanker registered in Liberia to Dutch interests and was negotiating sale of a second. Move was designed to free it from threat of union control—and inevitable operating losses (p. 44).

Propane producers and dealers can hardly wait for winter. Their stocks usually peak in October. But this year they're already at the highest point in history and setting a new record every day. Outlook: More propane going to storage until demand rises to meet production (p. 46).

Oil companies are losing favor among the nation's investment counsellors.

Survey of security analysts 2 years ago and again this year shows a sharp change. Number of analysts who rate oil high in growth potential dropped from 21% to 8%.

Their reasons: lower demand, oversupply, excess refining capacity, competition from gas and electricity. Some other factors: Threat of Russian oil, and lack of confidence that

U. S. executives can survive period of oversupply without ruinous price wars (p. 43).

Don't count out area pricing of natural gas yet.
Producers last week told the FPC it's too early to discard that approach. Their comments were the strongest support yet heard for this method of fixing producers' prices (p. 40).

Standard of Cal will build a 100,000-bbl. refinery at Pascagoula, Miss., if its merger with Standard of Kentucky goes through. Vote of stockholders is due September 7. New capacity will make Standard of Cal the nation's second largest refiner with 785,000 bbl. First is Humble, and dropping to third will be Texaco (p. 48).

Lube capacity is still edging upward. It's not because of a rising demand, however, since overcapacity is still the rule. The gain is a byproduct as refiners replace obsolete facilities.
Of five major processes, hydrogen treating, alone, is showing a sharp increase in use (p. 66).

Notes from around the world:
Europe is in danger of energy domination by Russia, says William R. Connole. If Europe doesn't develop its own gas supplies and a major transmission system within 5 years—when soviet gas will be available in quantity—it could wind up dependent upon Russian gas (p. 58).
Egypt is enthusiastic over its new Gulf of Suez field. It is estimating reserves at 314 million barrels, almost as much as in all other fields found to date (p. 64).
Libya objects to Esso's posting of $2.21 for Zelten crude, says it will "convince" Esso a higher price should be posted (p. 63).

News in the making

Journal sampling of tax and financial men shows that most feel IRS won't change its attitude toward simple ABC purchases of production. It may, they think, disapprove deals full of "gimmicks."
One expert says Government would lose money if it refused to approve sale of Honolulu. It would get more in capital gains, if the sale goes through, than it would in 12 to 15 years if Honolulu stayed in business and paid its taxes.

Chase Manhattan Bank's oil department is making a study supporting the existing method of handling reserved oil payments. Report will show Government would make more under present rates than under 52% rate it is proposing.

Vote on sale of Honolulu to Pan American and Tidewater, incidentally, is now scheduled for September 15, with or without favorable ruling from IRS.

Gas will get plenty of attention at New York's world's fair in 1964-65. More than half the 20,000 or more tons of air conditioning in fair buildings will use gas, and the fair, itself, is expected to be a billion-foot customer during its run. AGA's $6 million exhibit is the first to be approved by fair officials.

Underwater completions are spreading. A third operator, Texaco, has now used the technique. Texaco reportedly has completed one well in about 75 ft. of water on the ocean floor off Santa Barbara County and has a second well drilling. First to use the method was Richfield, followed by Standard of California.

Most comprehensive book ever written on Russian oil will be published late this year under API auspices. It will be based on observations of 10-man U. S. delegation during month-long tour a year ago and on search of soviet trade literature. Author will be Robert Ebel, Interior Department Russian expert who went with the delegation.

Canadians have been looking at something new in fighting the muskeg. It's a strange vehicle that scoots over land or water on a cushion of jetted air. After seeing films of prototype, built by Britain's Vickers-Armstrong, members of the Muskeg Committee decided it offers possibilities. But they'd trade its high speed for greater load and the ability to get higher off the ground than present. Further talks are planned on modifying vehicle for oil use in the muskeg.

The Washington outlook:

Future import-control picture looks uncertain. Interior officials hope to have their proposed regulation changes ready by mid-October, but probably are too optimistic. Task group now working on problems has a long way to go.

OCDM is studying huge pile of testimony it received on national security need—or lack of it—for residual-fuel import controls. Its decision could affect Interior's planning.

Meanwhile, Justice is checking complaints against Jersey Standard by some of Jersey's residual-fuel customers who are unhappy because the company said it would be able to supply them only 85% of last year's purchases.

Also, complaining firms say Jersey insists they turn over resid import "tickets" they got this year and, also, pay full cargo price on all resid bought from Jersey. Otherwise, they say, Jersey will cut them off and they'll run short.

Then there is the energy study being made by a House subcommittee under Rep. Tom Steed (D-Okla). This tends to thrust Congress further into the import-controls picture.

Likely result of all factors: Confusion for some time.

Market memo

Aug. 28, 1961

Ford's 1962 line of cars may force oil executives to **step up their planning** for future marketing strategy.

Ford will recommend oil drains every 6,000 miles on 1962 models instead of present 4,000; will have a factory-installed radiator coolant with a 2-year change interval; will recommend 30,000-mile lubrication for wheel bearings instead of 12,000 miles; and will use a fuel filter with a life of 30,000 miles instead of 8,000.

The Ford move is not entirely unexpected. It's just an extension of a trend started 2 years ago, but it strikes hard at motor oil and grease sales of oil companies.

Oil marketers have already started taking a hard look at **ways to increase the services or lines of merchandise** their dealers can offer the motorist to replace possible loss of lube and grease jobs. Everything is being considered: increase motor repair work, harder sell for tires, batteries, accessories, more auto supplies in the appearance group, or any goods or services connected with motoring, travel or recreation. Some even are considering handling a line of general merchandise built around the auto, and other are looking at cafe-motel schemes.

The industry, meanwhile, is sticking to its recommended program of a **2,000-mile oil-drain interval** or 60 days in summer and 30 in winter if the car is in limited use. Industry engineers are convinced motorists are in for trouble if they follow longer drain periods.

More urgent problem of oil marketers, however, is the ugly possibility of having to resort to **multigrade marketing of gasoline.** The Sun and Gulf moves to sell a sub-regular gasoline at prices equal to the independents have their major competitors looking at their hole cards.

Sun and Gulf both have announced they are selling lower-octane material in their sub-regular brands. Other majors claim, however, their checks show little significant difference from housebrand. These marketers consider a sub-regular as going to a lot of expense and trouble to get less money for gasoline. Nonetheless they are keeping close tab on Sun and Gulf business to check customer reaction.

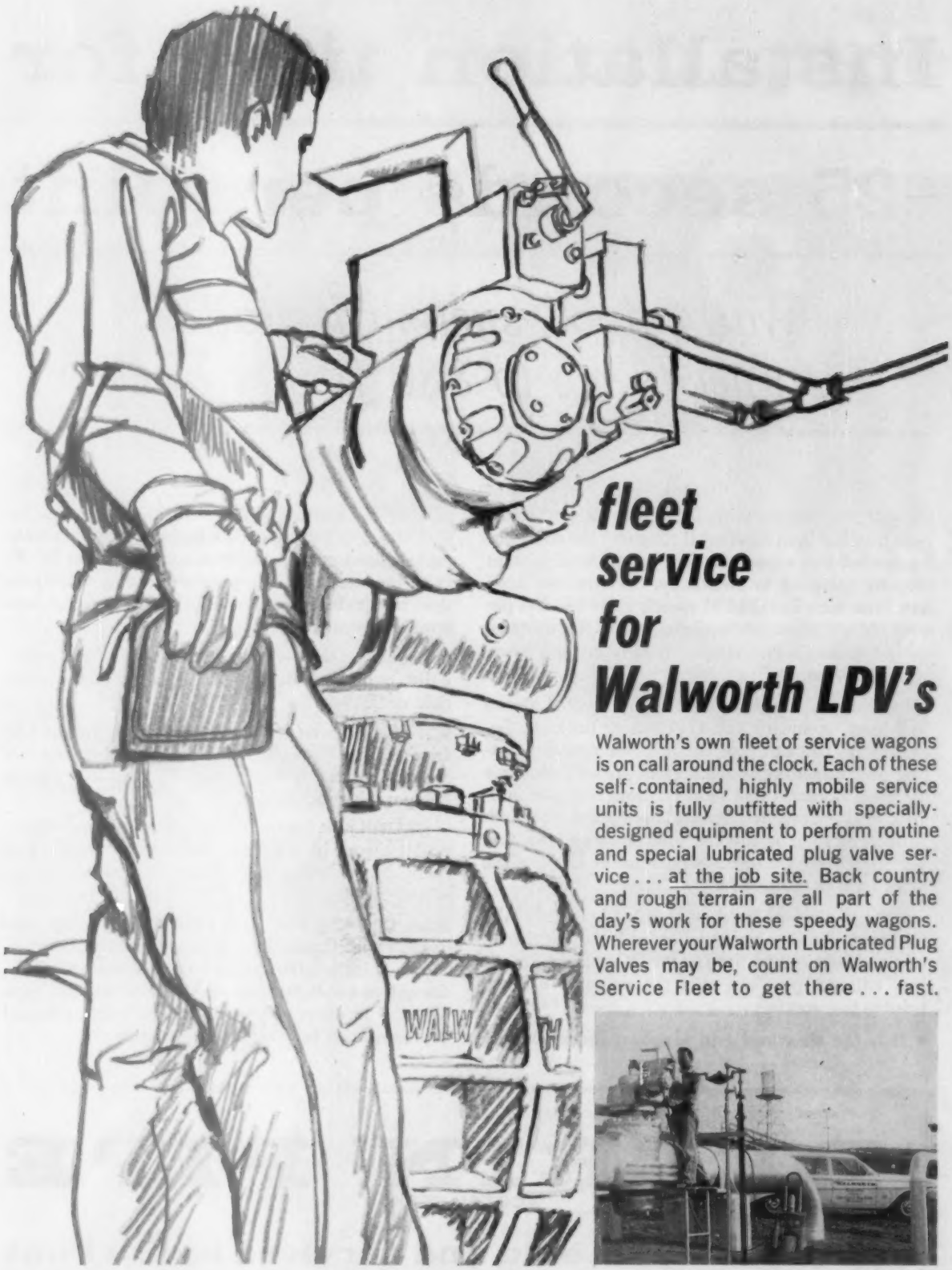
The price picture:

River markets were firmer last week, but the Gulf Coast was unusually quiet.

On the Gulf, one major took a cargo of gasoline at the low but general opinion was that it could be bought a quarter cent under and, under some conditions, as much as three-eighths off. No. 2 was hard to find under the 8.5-cent posting.

At mid-river points, No. 2 fuel for up-river movement was near Gulf Coast lows. But quotations could be shaded probably a quarter to three-eights, compared with half a cent a few weeks back.

Group 3 gasoline dropped half a cent to 11 cents in Great Lakes pipeline. Some material could be found at 11.75 cents.



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DELRIN pipe has been tested in over 6 years of laboratory work by Du Pont and by over three years of field installation in various oil-producing areas of the country.

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Du Pont Delrin™ pipe

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2 Pipe is inserted into female die of heating tool, a lightweight unit powered by a portable generator or other electricity source. Coupled end of pipe is being heated by male die of the tool.

3 After 15 seconds, tool is removed and the pipe end is quickly pushed into the coupling until the cold ring touches the face of the coupling. Both operators align pipe to be sure joint is straight.

4 Within 10 seconds, the molten resin has solidified to give a leak-free integral joint. Pipe may be tested at pressures up to 150% of the rated pressure. Total joining time: 25 seconds.

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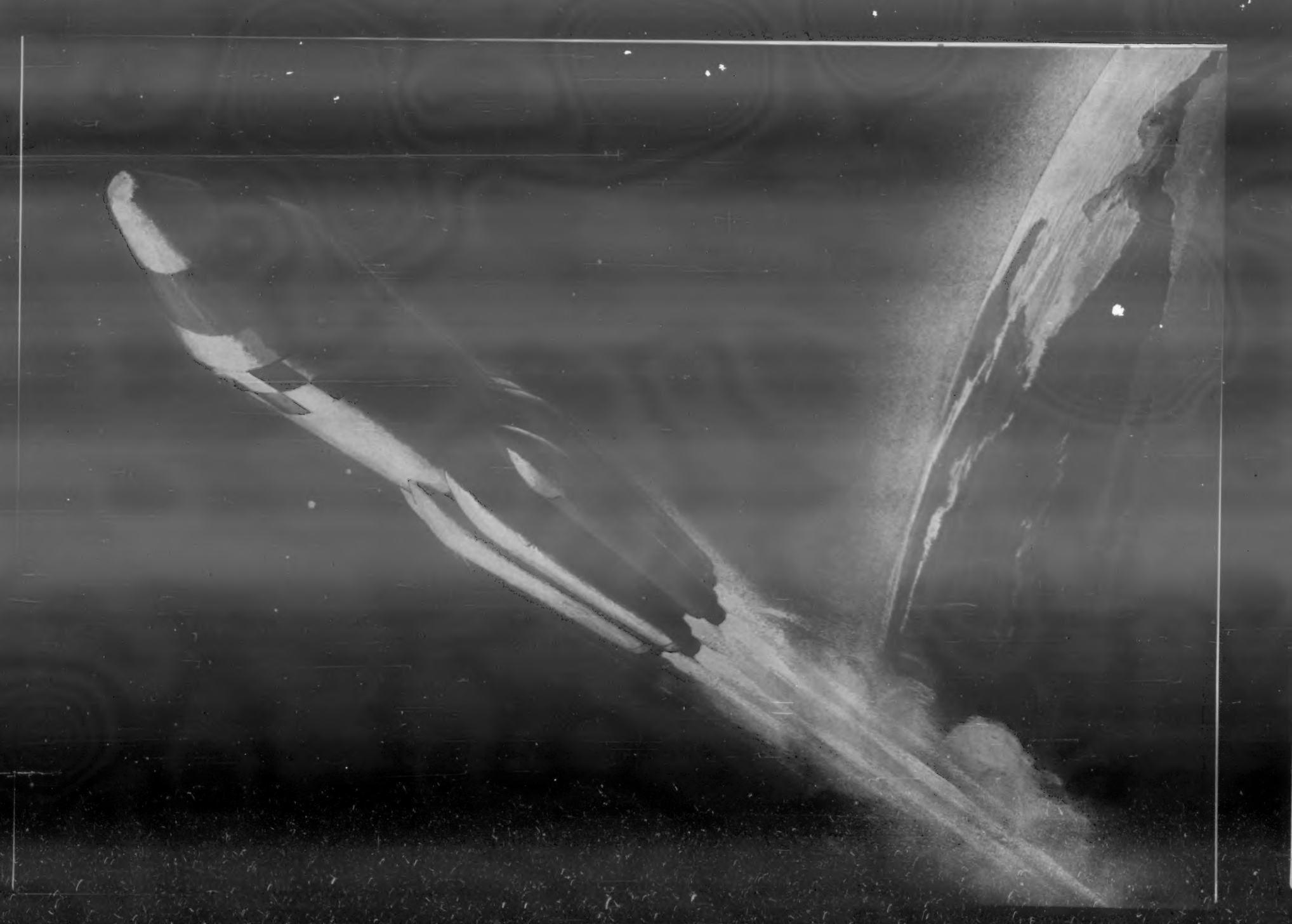

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Ingersoll-Rand HHE compressors help produce liquid hydrogen at world's first tonnage plant

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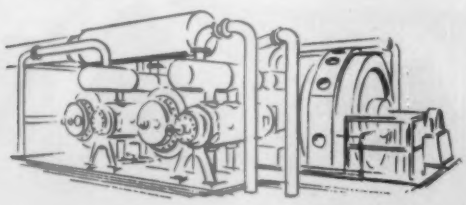
With its high energy content and light weight, liquid hydrogen makes possible a family of super-powered chemical rockets and nuclear rockets with extremely advanced performance.



The hydrogen is produced from crude oil by partial oxidation, and is then compressed, purified and liquefied.

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EQUIPMENT –

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Strategically located throughout the free world . . . backed by the most extensive research and chemical laboratories of *any* oilfield service organization.

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Penetrating Acid contains a surface active agent which tends to lower breakdown pressures in dense formations by imparting better "wetting" properties. The solution is designed for easier return of spent acid which is often needed in low pressure formations.

NE ACID *To Help Prevent Acid/Oil Emulsions*
In many instances, native crudes contain traces of emulsion stabilizers. Blended agents for Halliburton NE Acid aid in preventing emulsification of the crude with acid or spent acid.

HV ACID *Delayed Action For Better Results*
With additives, acidizing solutions can be "tailored" as true acidgels or as acid-in-oil emulsions. Each has controlled, increased viscosities for chemical retardation resulting in deeper penetration of unreacted acid. Formation characteristics determine the selection of the treating solution.

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Fe Acid is particularly suited for use in disposal and injection wells. Normally, an encrustation of solids, primarily iron compounds, plate out on the formation adjacent to the well bore – obstructing the permeability. This acid is designed to remove these solids and deter their re-precipitation within the formation.

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This additive is an economical approach to obtaining a retarded effect in any type of Halliburton acid solution. A more lateral movement of acid during treatment can be obtained with the Acid Loss Control agent covering a greater drainage area.

HF ACID *A Mud Removal Solution*
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YEAR INDUSTRIAL PRODUCTS

the case for using a SWACO D-GASSER on most of the wells you drill

Many operators and drilling contractors don't realize how D-Gassers can help them reduce the over-all cost of wells. By removing entrained gas and air from drilling mud after each circulation, the D-Gasser permits improved control of mud characteristics. As a result, many operators can profit from some of the following savings:

SAVES MUD AND CHEMICALS. If gas-cutting is encountered, the chances are good you can save on mud bills. The D-Gasser usually permits drilling without adding weighting material even though the well is "kicking" from drilled gas. It has been possible to keep mud weights more than a pound lighter than would have been possible without the D-Gasser. Over-treatment of mud (and the resulting stuck pipe and formation trouble) can be avoided when the D-Gasser is used. Trip gas and viscosity increases due to dissolved and entrained gas may be controlled without costly and time-consuming mud treatment.

SAVES LOST CIRCULATION MATERIALS. Since the D-Gasser often makes it possible to continue drilling while the well is "kicking", lighter mud can be used and lost circulation problems may be held to a minimum.

PERMITS FASTER, LOWER COST DRILLING. Drilling rates and/or footage per bit may be increased since light, low-solid muds may be used. Total drilling time may be reduced and fewer round trips may be required.

SAVES CASING. Frequently, operators avoid the expense of setting a long string just to evaluate a minor gas show. By eliminating the recirculation of gas, the D-Gasser prevents exaggerated impressions from minor shows. Occasionally, it has been possible to save an intermediate string when a D-Gasser is used.

SAVES WELLS. Many high pressure exploratory wells have actually been saved by the D-Gasser. Costly blowouts, fires and lost holes have been avoided. For full information on how the D-Gasser can help you, contact your nearest SWACO representative or write us direct.

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Here's how Petreco ELECTROFINING units improve distillates and lower costs:

SOME TYPICAL PETRECO DISTILLATE TREATER INSTALLATIONS

PLANT	VESSEL DIA. & LENGTH	1-STAGE OR 2-STAGE	CAPACITY B.P.D.	STOCKS TREATED	TYPE OF TREATMENT	REASON FOR TREATMENT	RESULTS OBTAINED PRODUCT QUALITY	SAVINGS
A	6'6"x21' Vertical	2-Stage	3600	Catalytic Gasoline	Caustic & Water wash	To remove organic acid, olefins, RSH, diolefins—to save caustic, reduce volume loss.	Reduces cu dish gum to specifications —doctor sweet after 24 hrs. storage. Passes engine test.	Caustic, gasoline, inhibitor.
B	10'x9' Vertical	1-Stage	16,000	Pressure Distillate	Acid Treat	To remove RSH—to remove tarry acid—to remove sulfur. To replace centrifuge machines.	Product contains specification residual sludge. Caustic is reduced about 30%.	Caustic volume loss. No centrifuging.
C	1–7'x20' Horiz.	1-Stage	22,000	Propane Bright Stock Blend	Acid Treat	Remove aromatics, improve color, improve vis.	Reduced residual acid to 50 ppm.	Lime, Acid, Clay
D	2–10'x21' Vertical	2-Stage	5000	Thermal Cracked No. 2 Fuel	Caustic & water wash	Odor improvement, color stability, prevent sediment, prevent product loss, RSH reduction, low metal ions.	Stable color. Low sedimentation. Some RSH reduction. No product loss. Low metal ion.	Caustic
E	3–10'x20' Horiz.	1-Stage	60,000	Kerosene	Caustic Treat	To remove naphthenic acid.	.002% residual moisture. 96% light transmission.	Caustic
F	10'x21' Vertical	2-Stage	10,000	Heavy cat. gas	Caustic & water wash	Remove organic acid, remove RSH. Conserve caustic, prevent product loss, prevent pollution.	Very stable product.	Caustic & spent Caustic salvaged
G	10'x21' Vertical	2-Stage	9000	Virgin Diesel Fuel	Caustic & water wash	Remove naphthenic acid. Prevent sedimentation. Prevent product loss.	Produced nil neut. no. product. Product passes British filter test.	Caustic
H	6'6"x9' Vertical	1-Stage	4500	Alkylation products	Acid precipitation	Remove acid sludge fines from product from H_2SO_4 alkylation unit.	Very low residual sludge on product. Less than .001% by volume.	Neutralizing reagents
I	2–10'x21' Vertical	2-Stage	6000	S.R. Naphtha	Acid alkali	Remove arsenic, lengthen catalyst life on platform charge.	Reduced arsenic from 175 PPB to 5 PPB. Reduced lead from 660 ppm to 20 ppm.	Clay life improved
J	8'x21' Vertical	2-Stage	5000	Jet Fuel	Acid alkali	Remove RSH, make government water tolerance test.	.002% residual sludge. Nil % residual H_2O.	Acid Caustic

This operations report on Petreco ELECTROFINING* Electric Precipitator Treating shows the improvement in product quality and the savings realized in typical installations. The table specifies how and why various stocks were treated.

The investment in ELECTROFINING *equipment to upgrade distillates was relatively small.* Installation occupies less ground space, uses fewer pumps, requires less piping than any other system capable of comparable results. The precise, automatic, continuous treatment reduces labor, conserves chemicals, and insures product uniformity.

If you would like to know more about these savings and what the ELECTROFINING process can do to improve and stabilize streams from your refining units, contact your nearby Petreco engineer, or write . . .

*Registered Trademark, Petrolite Corporation

DT-61-3

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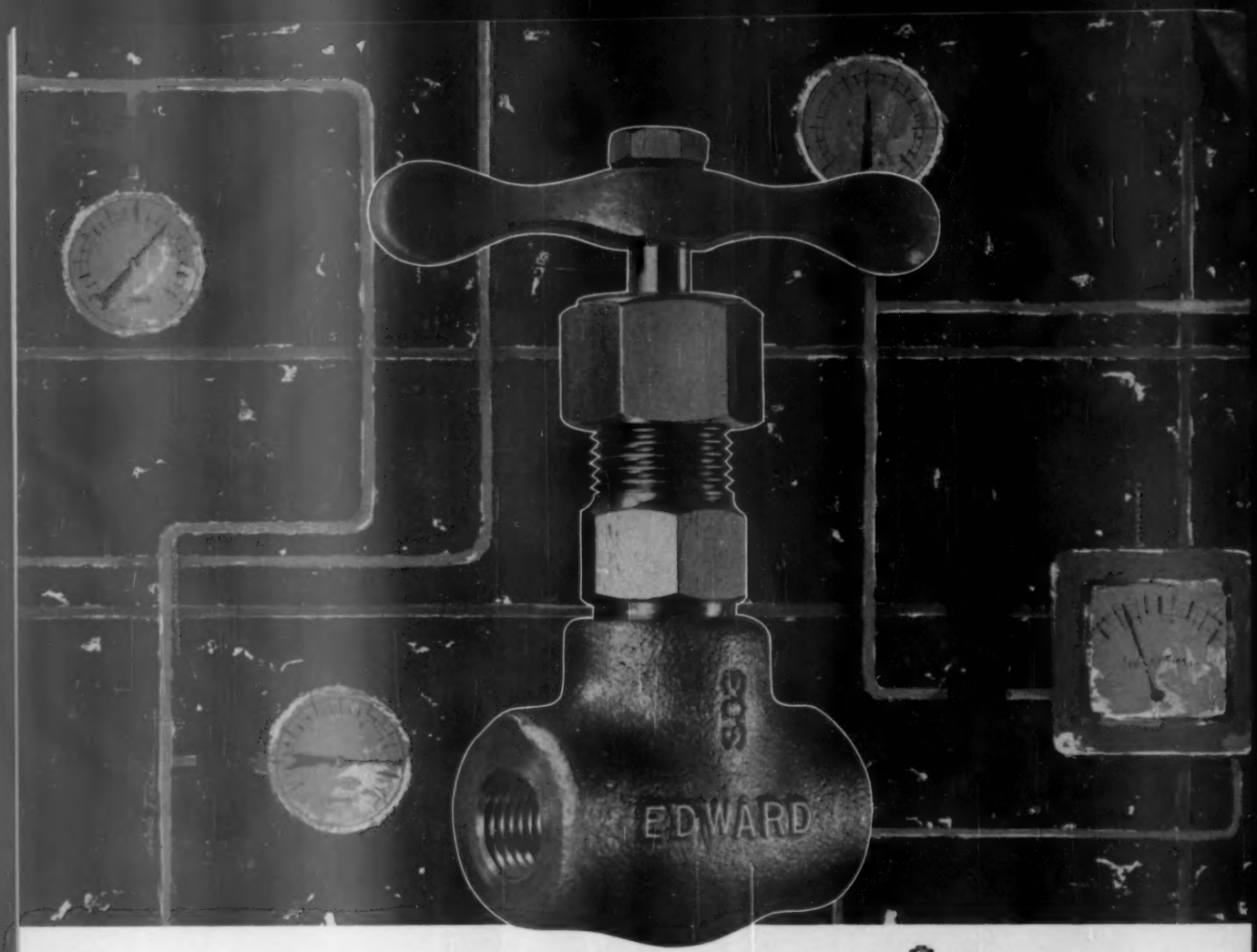
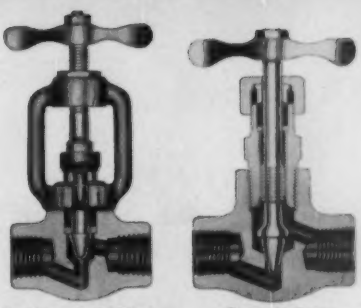


Edward Steel Gage and Instrument Valves provide dependable, finger-tip control

Edward gage and instrument valves will give you longer, more reliable service with less maintenance cost on pumps, separators, oil-field Christmas trees, and for meter, regulating, bypass, and dead-end lines. Edward gage valves are made of drop forged carbon steel or 18-8 stainless steel for sounder structure and greater strength than valve bodies machined from bar stock. Edward instrument valves have a carbon or 13% chromium stainless steel body. Carbon steel body has an integral cobalt-chromium-tungsten alloy steel seat that resists pitting and gives maximum resistance to corrosion and erosion. Choice of globe or angle body. For additional information, see your favorite distributor, or write to Edward Valves, Inc., 1212 West 145th Street, East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company.



Instrument Valve
Fig. 952 & 2952
6000 lb WOG

Gage Valve
Fig. 152 & 4152
4000 lb WOG

Contoured T-handle on both gage and instrument valves provides easy, finger-tip control. On gage valves, the bonnet and packing nut are EValized (exclusive Edward plating process) to minimize galling and corrosion. Instrument valves have EValized gland and gland bolt nuts, stainless steel gland bolts. Taper-threaded joint between bonnet and body of gage valves prevents bonnet from backing out of valve. Instrument valves are of bonnetless design. Semi-needle, integral stem-disk is made of EValloy 13% chromium or 18-8 alloy stainless steel, hardened for wear resistance.

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ROCKWELL

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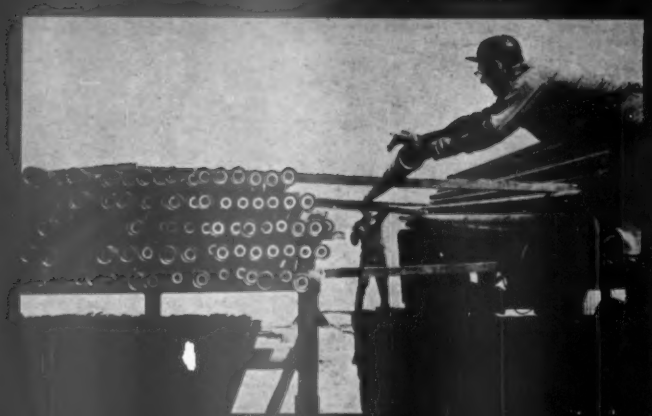

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This Thermofor Catalytic Cracker for Signal Oil and Gas was moved from Signal Hill and reconstructed at the Bakersfield Refinery by Parsons. In updating the TCC unit, its capacity was increased from 6,000 to 8,200 BPD.

Also as part of this project, Parsons designed, handled detail engineering, procurement, and construction of a Catalytic Reformer and Desulfurizer for the Bakersfield Refinery. For design, engineering and construction always...

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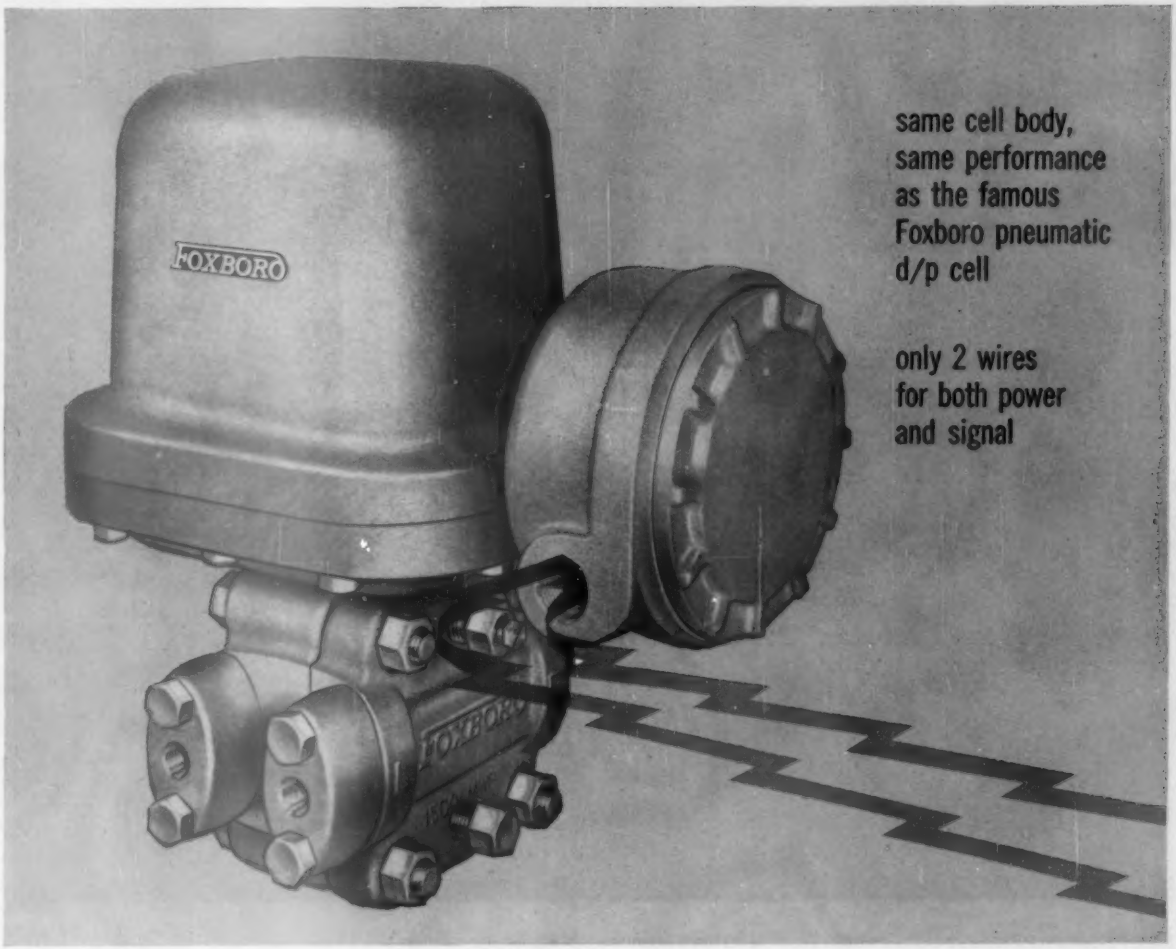
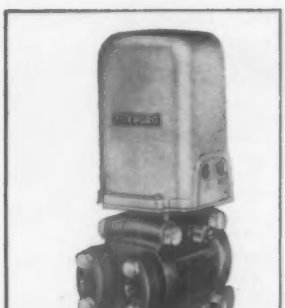
introducing the Foxboro electronic d/p cell* transmitter





The Foxboro electronic d/p cell transmitter and this Foxboro pneumatic d/p cell transmitter use the identical cell body. Only the top transmitting mechanism has been changed.

Yes, Foxboro has taken its famous pneumatic d/p Cell and added the benefits of electronic transmission. It's the new Foxboro *electronic* d/p Cell transmitter. Look at the results:

- both power and signal travel over the same pair of unshielded wires — no field power supply required
- pressure, flow, and level transmission up to several miles without lag
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- high level 10-50 ma d-c signal provides powerful rebalancing force
- adjustable ranges from 5" to 850" water with external zero adjustment — working pressures of 1500 and 6000 psi

And, of course, you get the same positive overrange protection, the same high sustained accuracy, the same rugged construction that has always been standard with the Foxboro d/p cell transmitter.

If you're thinking "electronic," it will pay you to investigate this important instrument in the Foxboro Electronic Consotrol* family. Get in touch with your Foxboro Field Engineer for complete details, or write for Bulletin 21-10. The Foxboro Company, 608 Neponset Avenue, Foxboro, Massachusetts.

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60-HP HEAVY-DUTY AIR-COOLED ENGINE
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NEW 60 HP. WISCONSIN MODEL V-460D WITH VALVE-IN-HEAD DESIGN!

Now Wisconsin offers you more power . . . amazing compactness...greater efficiency and economy . . . and simplified upkeep.

On all counts, the new V-460D is the most compact 60-hp heavy-duty air-cooled engine on the market. It is precision-built for all-weather dependability and long life in severe applications. And it's designed to bring you savings as soon as you specify it for your equipment or job.

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Valve-in-head design and higher compression bring you greater fuel economy with *regular* gasoline. They provide cooler and more efficient engine performance, and slash upkeep. Even removing a cylinder for piston or ring replacement takes only minutes!

Check its high-torque lugging power — its economical operation — and its simplified maintenance. Then specify it for your equipment or operation in the 36- to 60-hp range. Get Bulletin S-282.

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- **Controlled pressurized lubrication for full-time oiling to all working parts.**
- **Automatic protection against overheating and servicing neglect.**
- **12-volt electric starter with distributor ignition.**
- **Wide range of optional equipment and accessories.**

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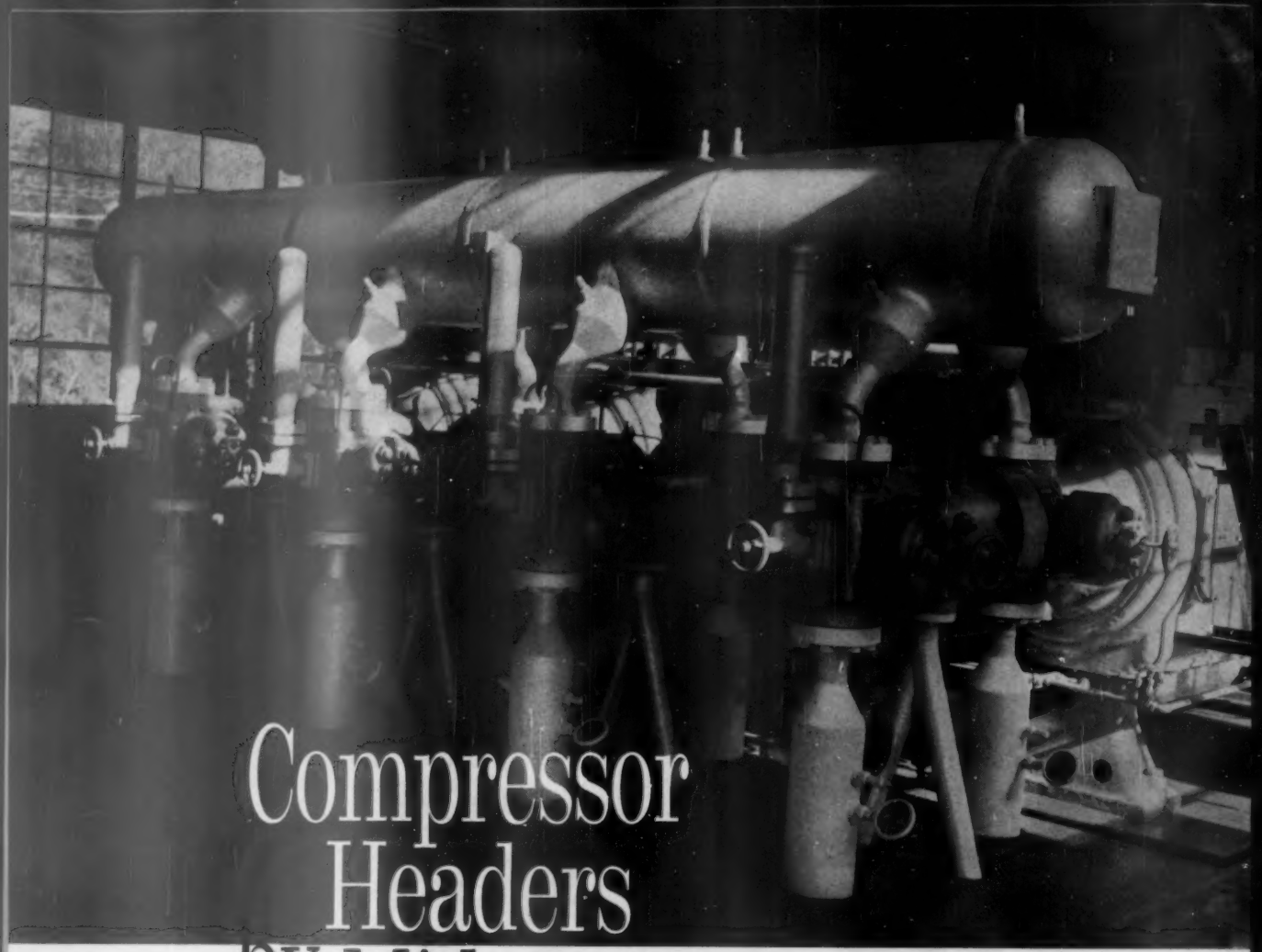
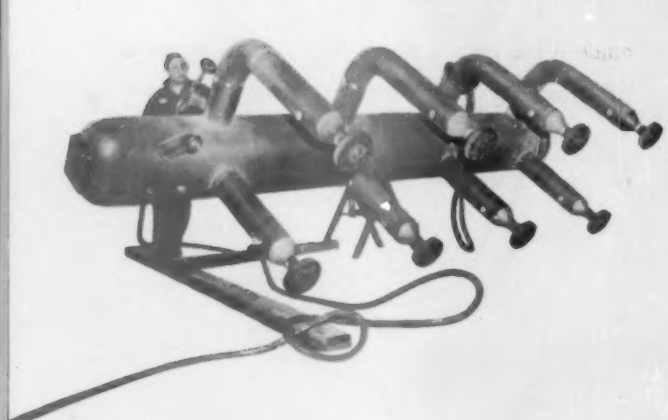


Compressor Headers by Midwest

Fabricated to your specification ...extruded or welded design...in any weldable metal



These compressor headers, fabricated for United Fuel Gas Company's compressor station at Coco, W. Va., are typical of the precision and quality of Midwest workmanship.

Upper header, formed of 24" O. D. x 1¾" thick rolled and welded Grade B carbon steel plate, has eight 8" extruded outlets reducing to 3" 1500 lb. flanged ends, and one 8" and one 3" full-size flanged outlets.

Lower header, of same diameter and wall thickness, contains eight 8" extruded outlets reducing to 3" 1500 lb. flanged ends, one 4" outlet, plus a 24" x 6" extruded cap.

This station, operating at 2000 lb. pressure, comprises five 880 HP and one 1100 HP gas engine compressors.

Midwest can produce headers to your exact specifications, in either welded or extruded type, and will gladly offer assistance on manufacturing and metallurgical problems.

New 36-page brochure, PIPELINE FITTINGS, describes Midwest fittings and fabricated piping for pipelines. FREE!

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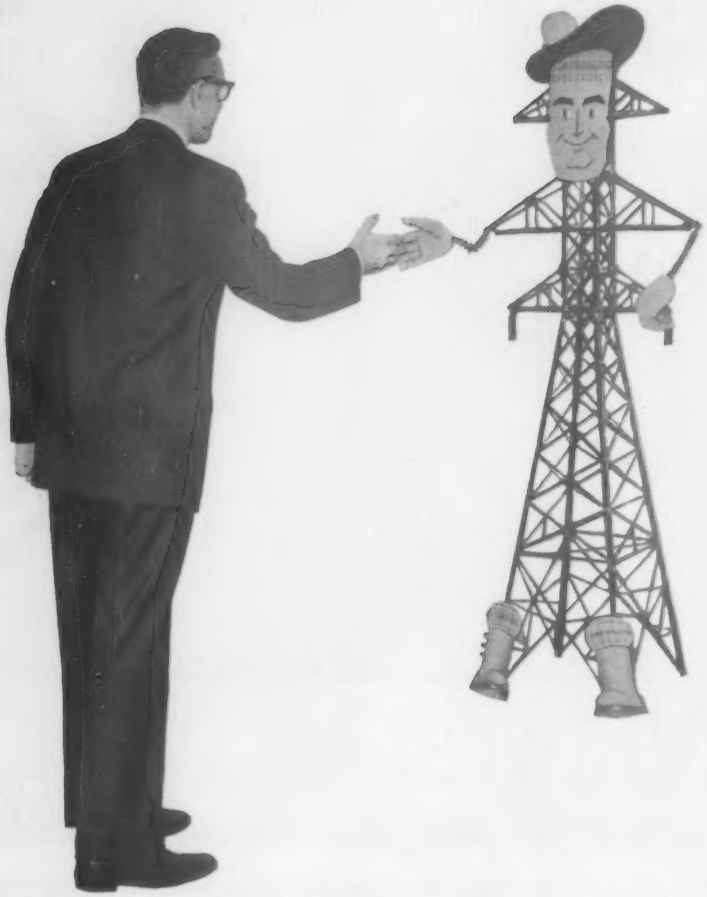
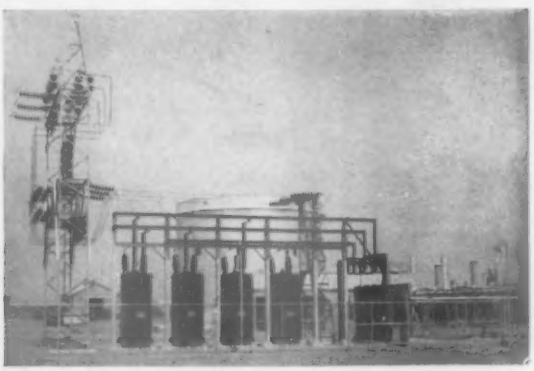


The increasing availability of utility electric power has made it more and more useful in the current drive to stop waste of time, money, and manpower. The many economies of utility electric power have made it the ideal solution to problems in pumping, waterflooding, gathering, transmission as well as refining. For the latest facts on purchased electric power, consult your Utility Electric Power Company.



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62 GROVE G-4 MAINLINE VALVES IN THE ALBERTA-CALIFORNIA LINE

Throughout the 1,018 miles of its 36" section, the new Alberta to California natural gas pipeline uses Grove Series G-4 mainline valves. These valves are among the largest full-opening mainline valves ever put in service. They feature the field proven patented Grove Seal-"O"-Ring® design, with its "double-barrier seal." A positive, primary metal-to-metal seal is backed up by the squeegee and sealing action of protected o-rings, to assure a bubble-tight seal, easy open and close. Because G-4 valves do not rely on sealing compounds, they completely eliminate all maintenance costs relative to lubrication.
Call your nearest Grove office and learn how Grove pipeline valves can serve and save for you in your next pipeline.

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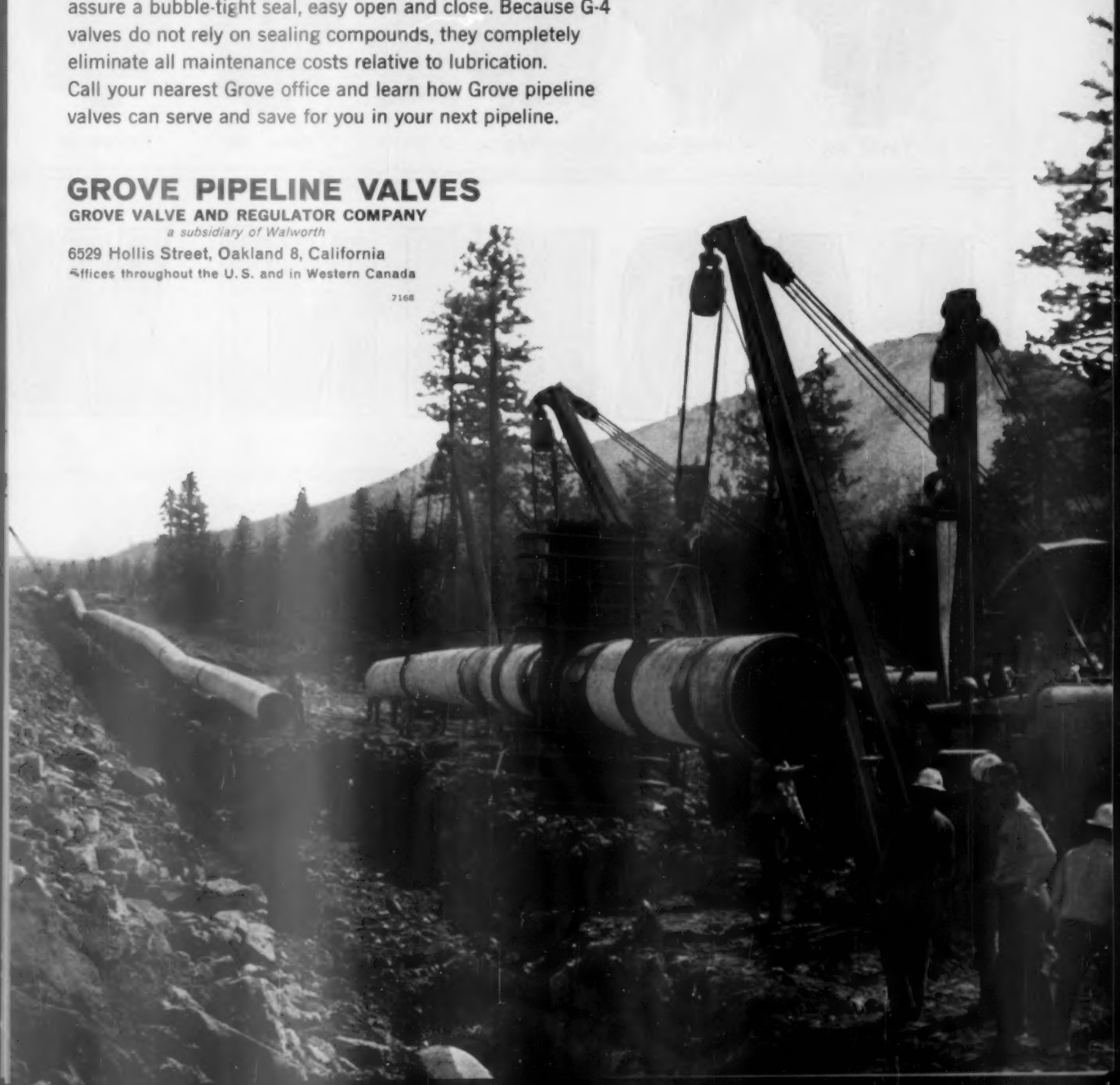
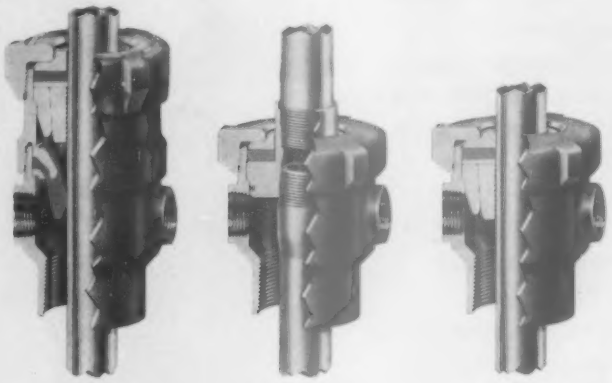


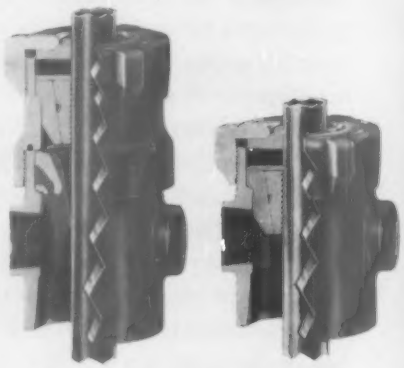
a complete selection for wells

1000 — P. S. I. Working Pressure



TYPE SK TYPE MK TYPE K

2000 — P. S. I. Working Pressure



TYPE SR TYPE R

LARKIN W

2000 — 3000 — P. S. I. Working Pressure

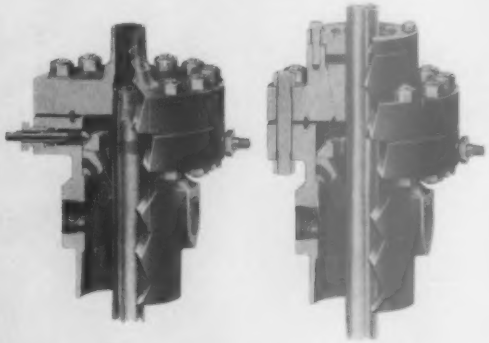
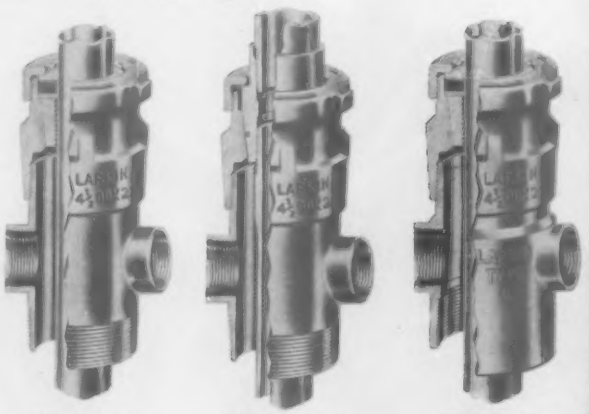


FIG. 612 MANDREL TYPE

FIG. 612 SLIP TYPE

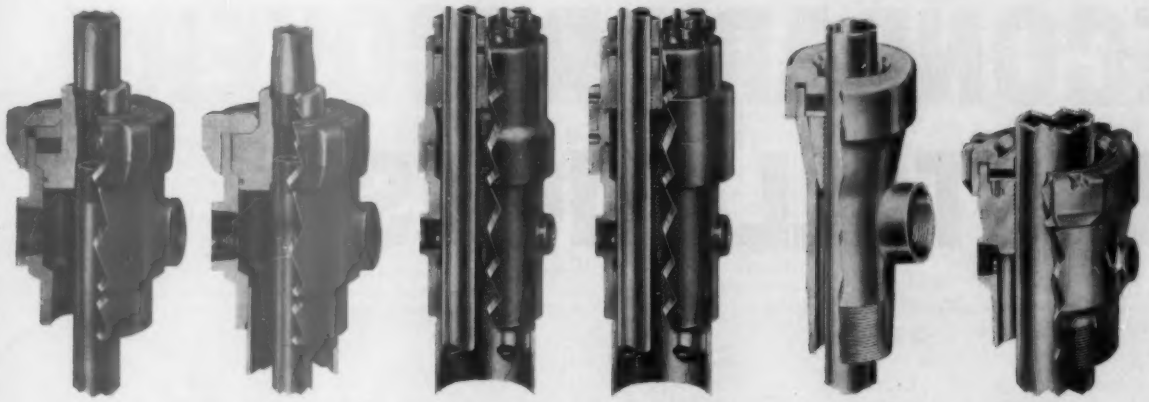
500 — P. S. I. Working Pressure



TYPE H TYPE MH TYPE Q

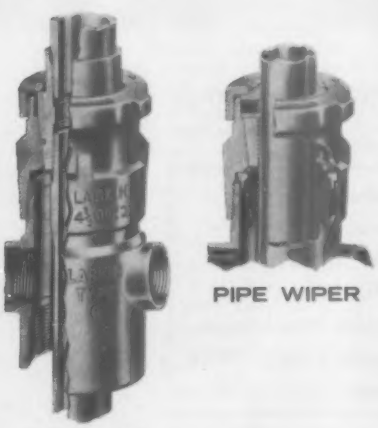
LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEP

# of medium depths and pressures



TYPE MR TYPE MOR TYPE D TYPE DS TYPE X FIG. 92

ELL HEADS



PIPE WIPER

TYPE MQ

NDABLE PERFORMANCE

"K" Series (SK, K, MK) — 1000 psi W. P. Tubing Heads designed along the lines of the "R" Series. They also are adaptable to multiple suspension service.

"R" Series — (SR, R, MR, MOR) — Forged steel 2000 psi W. P. Tubing Heads with a record of many years of satisfactory service. All "R" Series Heads may be converted to a stripper type by addition of a Stripper Adapter and Hycar Stripper.

"D" Series (D, DS) — Forged steel 2000 psi W. P. Tubing Heads using the standard "R" Head Body. They are illustrated to show dual completions but have been successfully adapted to additional tubing strings.

"X" — Furnished for 2", 2½" or 3" tubing with male or female bottom connection. Will suspend "macaroni" from ¾" to 1½". Also available with mandrel suspension, Type MX.

Fig. 92 — A 2000 psi W. P. Casing Head with forged steel body. It is a good companion head for "R" and "D" Series. It has been successfully adapted to suspend multiple strings of larger sized tubing.

Fig. 612 — Tubing Heads with flanged bonnet available with mandrel or slip suspension for Series 600 (Fig. 612-6) or Series 900 (Fig. 612-9) service.

"Q" and "H" — Economical Tubing Heads available for use on 2" through 7" casing to suspend ¾" through 4" tubing. The Pipe Wiper will hold pressures within the rating of these Heads.

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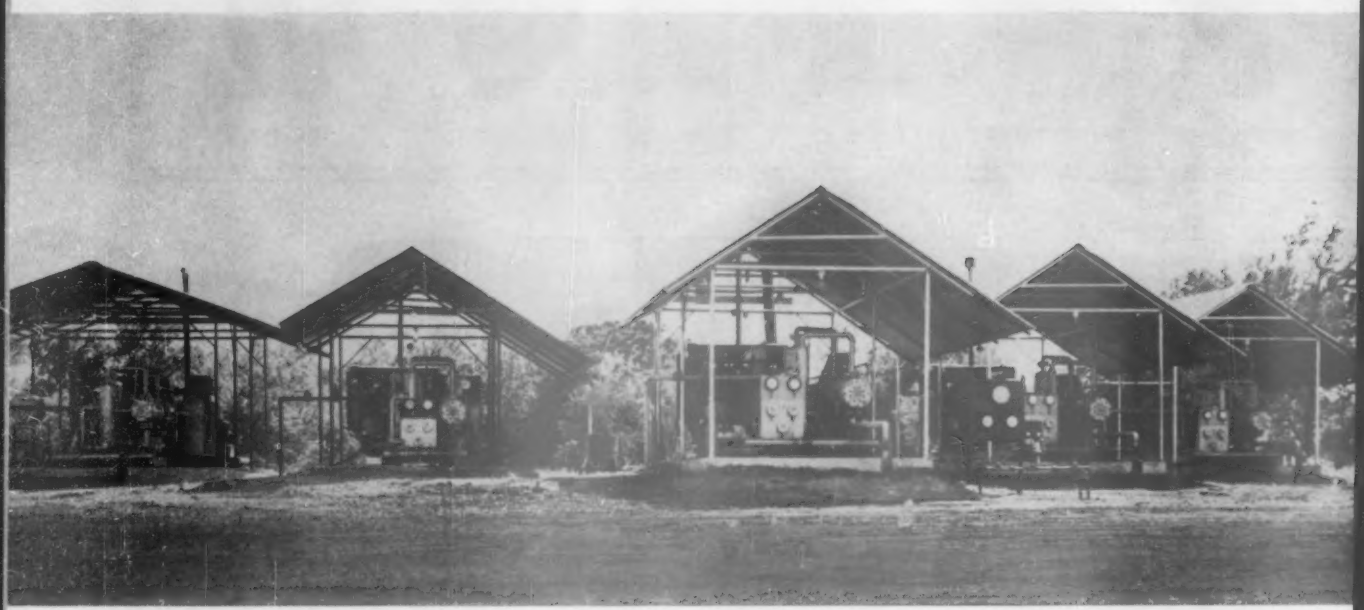

This battery of heavy duty compressor units supplied by Mid-Continent is helping to increase oil production for our Corsicana, Texas customer.

Whatever or wherever your secondary recovery equipment requirements, Mid-Continent can assist with trained personnel and a complete line of quality products to meet your exact needs. Following is a partial list of secondary recovery equipment available through Mid-Continent:

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Controls, Pneumatic	Gauges

SR1-1

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They Say—

Not so fast, please!

Dear Sir:

As you know, Atlantic has been working hard at increasing its ratio of crude produced to refinery runs, and we think we have done a pretty good job at it, since our ratio was 84% in the first 6 months of 1961 vs. 78% at the same time last year.

We sure wish, however, that we could increase our production at the fantastic rate the Journal reported on Page 76 of the August 7 issue.

Atlantic's 6 months' statement reported that total crude-oil production averaged 159,700 bbl. per day in the first 6 months of 1961, an increase of 6% over the first 6 months of last year.

In setting up the table on Page 76 of the Journal, our average production was erroneously reported as 199,700 bbl. per day, which someone calculated was a 32.2% increase. But we got an even bigger boost in the actual text of the article when this erroneous 32.2% was reported as "a record 82% increase in liquids produtcion."

William G. Shain, Director
Industrial and Public
Relations Department
Atlantic Refining Co.

No record net for Sun

Dear Sir:

You gave us more credit than we were due in your report in the August 7 issue on our first half 1961 financial results (p. 75-76).

While our gross for the period was the highest for any first half year in Sun's history, the net, as our release pointed out, was the highest since 1957 when it totaled $25,187,000 (compared with $24,048,000 for the first half of 1961).

W. W. Weston
Public Relations Department
Sun Oil Co.

Only Sun's gross was a record—Ed.

Profit—the best motivator

"If those who head up our city, state, and national governments

would only accept the truth that profit is the greatest motivator for growth—and improve the climate so investors and businessmen could see a possible profit increase—the country would start rolling ahead rapidly. It wouldn't be pure inflation either."

Editorial in the Oil City, Pa., Derrick.

Texaco for tariffs

"The mandatory (imports) control program could directly affect the security of the entire nation by unnecessarily interfering with the free play of competition in the international petroleum market.

"It is Texaco's position that a more desirable solution to the imports problem would be to establish a system of tariffs. A base level of imports could be taxed at one rate, with imports in excess of this level being taxed at a much higher rate.

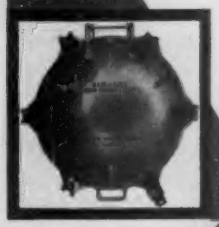
"This system would meet the Government's broad objectives while at the same time minimizing the discrimination inherent in the present program. The importing companies would regain full access to the oil they have searched for and discovered overseas, they would no no longer be required to subsidize their competitors, and the Government would realize substantial new revenue."

Article in the summer 1961 issue of Texaco Star, magazine of Texaco Inc.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

at last—

A MANWAY COVER THAT REALLY DOES THE JOB!



Enardo's brand new 7620 Cam-Loc Quick Opening Manway Cover has all the ingredients — it's big enough (20 inches) to provide easy access, versatile enough to handle a variety of applications, positive sealing yet opened in seconds with the time-saving Cam-Loc.

The 7620 cover is available in either aluminum or Meehanite and has been used effectively on lease vessels, tank cars, tank trucks and all kinds of vessels with pressures up to 50 psi. It has been tested with many types of fluids and can even handle bulk cement and dry bulk solids such as grain and flour.

The 7620-SA1 base is made of SA-283C, grade C, steel and is coded according to ASME specifications. Partial Data Reports can be furnished on each cover so the vessel manufacturer can obtain ASME code.

Call, write or wire Enardo Manufacturing Co. for more information.

ENARDO manufacturing co.

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CALENDAR

AUGUST

28-30 Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

28-Sept. 1 American Society of Mechanical Engineers, international heat transfer conference. Boulder, Colo.

SEPTEMBER

5-8 American Chemical Society, Chicago section, eleventh national chemical exposition, International Amphitheatre, Chicago.

7-8 Rocky Mountain Association of Geologists, field conference, Salida, Monarch, Ouray, Silverton, and Durango, Colo., areas.

7-9 Magic Plains Oil Exposition, Borger, Tex.

7-9 Alberta Society of Petroleum Geologists and Geological Association of Canada, convention and field trip, Canadian sedimentary basins, Calgary.

11-15 Instrument Society of America, fall instrument-automation conference and exhibit and sixteenth annual meeting, Biltmore Hotel and Memorial Sports Arena, Los Angeles.

12-13 American Gas Association, Southern Gas Association, annual accident prevention conference Statler Hilton Hotel, Dallas.

13-15 Pacific Coast Gas Association, convention and annual meeting, Coronado Hotel, Coronado, Calif.

13-15 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

13-15 National Petroleum Refiners Association, fall meeting, Traymore Hotel, Atlantic City, N. J.

13-15 National Northern Development Conference, "Canada's New Role in Resource Development," MacDonald Hotel, Edmonton.

14 Natural Gas Processors Association, Rocky Mountain regional meeting, Northern Hotel, Billings, Mont.

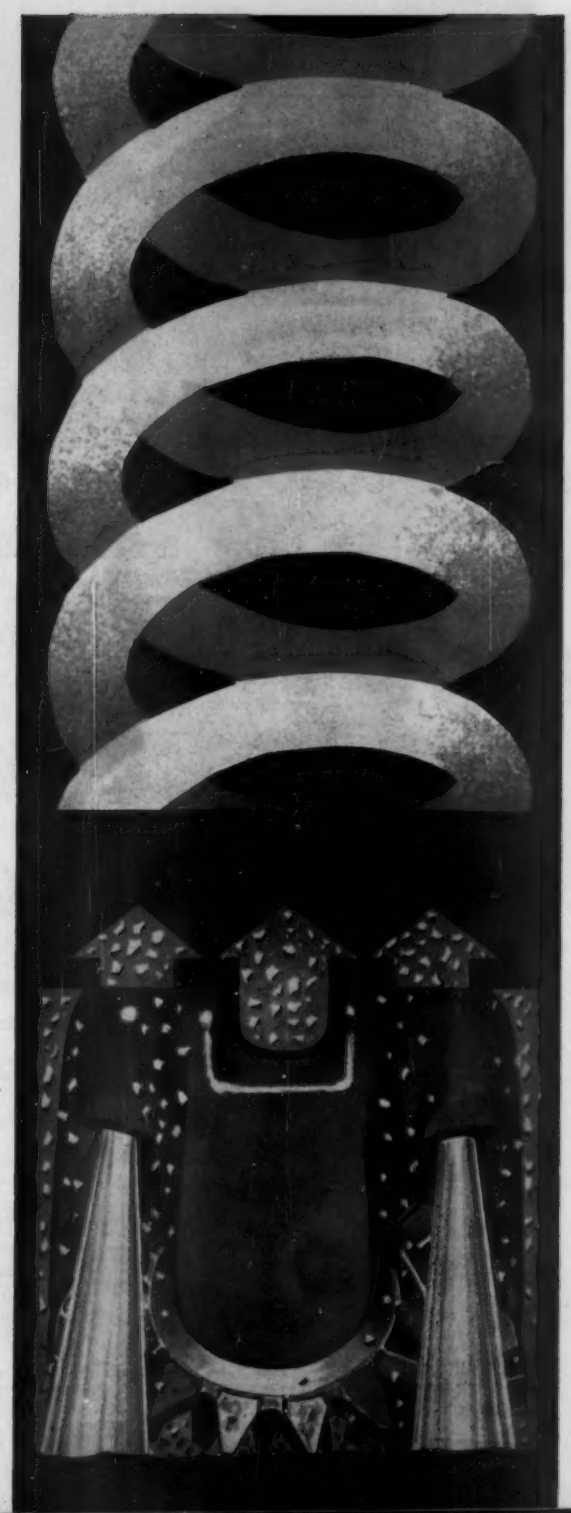
15-16 Kansas Geological Society, annual field conference, Mark Twain Hotel, Hannibal, Mo.

17-20 American Institute of Electrical Engineers, annual electrical conference of the petroleum industry, Jung Hotel, New Orleans.

18-19 Independent Natural Gas Association of America, annual meeting, Shamrock Hilton Hotel, Houston.

18-20 Standards Engineers Society, tenth

milling or drilling?



How can you tell if you're milling or drilling? It's easy. If you are using Reed Flush-Flo jet bits you **know** you're drilling ahead. Here's why—

1—The Flush-Flo ports allow an alternate route around the high velocity jets. Laboratory tests prove the Flush-Flo design allows the drilling fluid to sweep the entire bottom of the hole, whereas other jet type bits develop little fluid movement at the center.

2—Jet bits without Flush-Flo ports require all cuttings and circulating fluid to return past the high velocity discharge jets. Flush-Flo design provides up to 50% more return area, prevents re-circulating of cuttings, balling and re-drilling cuttings.

3—The Flush-Flo ports minimize hydrostatic pressure on the formation when running in the hole and minimize swabbing when pulling the string. These two factors afford maximum protection and minimum mud bills when drilling in lost circulation areas and leave wall cake and walls in better condition.

4—The flow pattern of the Flush-Flo jet bit provides less turbulence at the bit and affords greater protection in very soft formations.

The Flush-Flo design is an exclusive from the Reed research team—the most significant development since the advent of jet bits. The place to look for progress in drilling tools is right here at REED.

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annual meeting Hotel Sherman, Chicago.

20 API, Coalinga - Kettleman chapter, annual barbecue and golf tournament, Polvadero Country Club, Coalinga, Calif.

20-21 National Petroleum Refiners Association, Rocky Mountain regional meeting, Henning Hotel, Casper, Wyo.

20-21 American Institute of Electrical Engineers, Institute of Radio Engineers, Instrument Society of America, industrial electronics symposium, Bradford Hotel, Boston.

20-21 Ohio Petroleum Marketers Association, fall conference, Commodore Perry Hotel, Toledo.

20-22 National Association of Corrosion Engineers, Permian Basin section, annual West Texas corrosion tour, Lincoln Hotel, Odessa, Tex.

21-22 Air Pollution Control Association, east-central section, annual meeting, Sheraton-Seelbach Hotel, Louisville, Ky.

22-23 Association of Desk and Derrick Clubs, tenth annual meeting, Rice Hotel, Houston.

24-27 American Institute of Chemical Engineers, national meeting, Lake Placid Club, Lake Placid, N. Y.

24-27 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Muehlebach Hotel, Kansas City.

25-27 Texas Mid-Continent Oil and Gas Association, annual meeting, Texas Hotel, Fort Worth.

25-28 American Welding Society, fall meeting, Adolphus Hotel, Dallas.

OCTOBER

1-4 American Gas Association, annual convention, Dallas.

3-4 University of Kansas, ninth annual gas measurement institute, National Guard Armory, Liberal, Kans.

4-6 American Association of Oilwell Drilling Contractors, annual meeting, Rice Hotel, Houston.

4-6 American Society of Mechanical Engineers, process-industries conference, Shamrock-Hilton Hotel, Houston.

4-6 American Society of Photogrammetry, semiannual convention and technical exhibit, Biltmore Hotel, New York.

8-11 Society of Petroleum Engineers of AIME, annual fall meeting, Memorial Auditorium, Dallas.

11-12 National Petroleum Refiners Association, waste disposal and stream pollution conference, Hotel Lassen, Wichita.

12-13 California Natural Gasoline Association, annual fall meeting, Lafayette Hotel, Long Beach, Calif.

15-17 National Association of Oil Equipment Jobbers, annual convention and trade show, Mayflower Hotel, Washington.

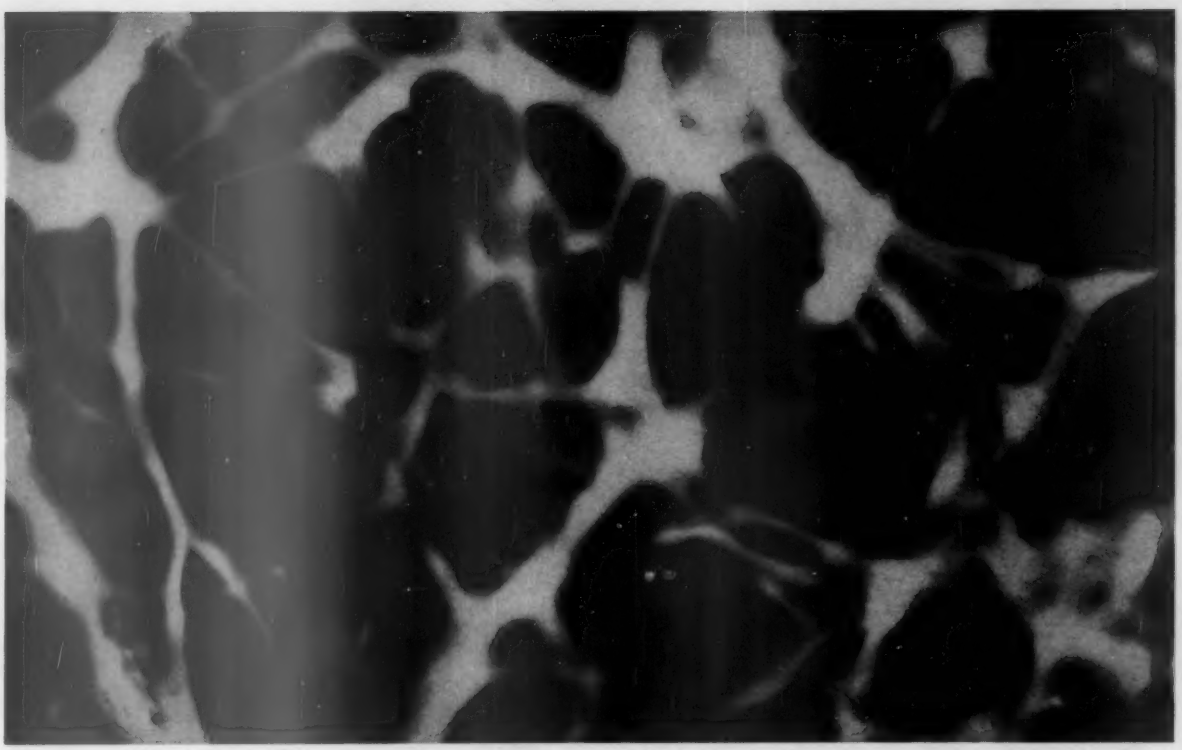
15-18 American Petroleum Credit Association, annual conference, Shamrock-Hilton Hotel, Houston.

17-19 American Society of Mechanical Engineers, American Society of Lubricating Engineers, lubrication conference, Morrison Hotel, Chicago.

18-20 Rocky Mountain Oil and Gas Association, annual conventon, Denver-Hilton Hotel, Denver.

18-21 American Association of Petroleum Geologists, Mid - Continent regional meeting, Amarillo, Tex.

19 West Central Texas Oil and Gas As-



electron micrograph shows why Slick Water reduces pumping horsepower losses during well treatments

This electron micrograph shows an 11,000-time magnification of the polymer in Slick Water*, Dowell's friction-reducing agent for water. Agents providing a similar effect are also available for oil and acid. ☐ Notice the structure of the polymer. It is believed that the polymer confers an elastic behavior which suppresses the usual turbulence of fast-flowing fluids. This action saves much of the energy lost by random turbulent motion and reduces friction in the pipe.

This means lower fluid friction and greater pumping efficiency

What can Slick Water do for you? It all depends on your well and your treatment requirements.

In some cases, it means that you may need only one pump truck instead of three for fracturing or acidizing. You pocket the saving!

In some cases, it may mean that you can get the benefits of high-injection-rate fracturing without having to pull tubing.

In other cases, it may mean that you can attain desired injection rates, yet stay within the pressure limit set by the strength of the casing.

In still other instances, it may mean that you can perform larger, higher-rate treatments and profit from bigger production increases.

And sometimes, it may mean that you can use a lower cost fluid – again reducing treatment costs.

Dowell friction-reducing agents have helped operators get lower treatment costs and greater production increases. Ask your Dowell representative for more information. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela, Argentina, Germany, France and the Sahara area. Dowell, Tulsa 1, Oklahoma. *DOWELL TRADEMARK

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Our population is growing, moving, shifting. And more people than ever need more goods—opening new areas in which to build your business, to provide more jobs in America's growing economy.

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NOW'S THE TIME TO GET GROWING IN A GROWING AMERICA!

sociation, annual meeting, Hotel Windsor, Abilene, Tex.

19-22 Louisiana Gulf Coast Oil Exposition, Lafayette, La.

24-25 University of Kansas, Southwest Kansas Center, sixth annual natural-gas pipeline institute, Court House, Liberal, Kans.

24-25 Pennsylvania Grade Crude Oil Association and Pennsylvania State University Mineral Industries Experiment Station, technical conference on oil recovery by solvents, Pennsylvania State University campus, University Park.

24-27 National Association of Corrosion Engineers, south-central region conference and exhibition, Shamrock-Hilton Hotel, Houston.

25-26 National Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.

25-27 Gulf Coast Association of Geological Societies, annual meeting, Granada Hotel, San Antonio, Tex.

27 Natural Gas Processors Association, southern regional meeting, Carlton Hotel, Tyler, Tex.

29-31 Independent Petroleum Association of America, annual meeting, Shamrock-Hilton Hotel, Houston.

29-Nov. 1 National Lubricating Grease Institute, annual meeting, Rice Hotel, Houston.

NOVEMBER

1-3 Southwest Federation of Geological Societies, annual meeting, Hilton Hotel, El Paso, Tex.

2-3 Society of Petroleum Engineers of AIME, annual California regional meeting, Hacienda Motel, Bakersfield, Calif.

2-3 API, annual agriculture - petroleum seminar, Louisiana State University, Baton Rouge.

2-4 Geological Society of America, annual meeting, Cincinnati, Ohio.

5-9 Society of Exploration Geophysicists, international meeting, Denver.

6-8 Chemical Institute of Canada, conference of the chemical engineering division, Royal York Hotel, Toronto.

9-10 Society of Automotive Engineers, national fuels and lubricants meeting, Shamrock-Hilton Hotel, Houston.

13-15 American Petroleum Institute, forty-first annual meeting, Conrad Hilton, Congress and Palmer House hotels, Chicago.

16 Illinois Oil and Gas Association, annual meeting, Mount Vernon, Ill.

17 Natural Gas Processors Association, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

26-Dec. 1 American Society of Mechanical Engineers, winter annual meeting, Statler-Hilton Hotel, New York City.

DECEMBER

3-6 American Institute of Chemical Engineers, annual meeting, New Yorker Hotel, New York City.

4 AIME's Society of Petroleum Engineers, Arizona section, annual meeting, Pioneer Hotel, Tucson.

4-6 Interstate Oil Compact Commission, annual meeting, Denver Hilton Hotel, Denver.

5-6 National Petroleum Refiners Association, computer conference for refiners, Hotel Tulsa, Tulsa.

JANUARY

7-10 Pipe Line Contractors Association, annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

8-12 Society of Automotive Engineers, annual meeting, Cobo Hall, Detroit.

16-18 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville, Ky.

19 Natural Gas Processors Association, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

FEBRUARY

4-7 American Institute of Chemical Engineers, national meeting, Statler Hotel, Los Angeles.

14-17 Pipe Line Contractors Association of Canada, Castle Harbor Hotel, Bermuda.

15-17 Southwestern Legal Foundation, annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.

18-22 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, New York City.

27-Mar. 2 International Oil and Gas Educational Center, institute on economics of the gas industry, Southwestern Legal Center, Dallas.

28-Mar. 2 American Petroleum Institute, Division of Production, southern district meeting, Rice Hotel, Houston.

MARCH

2 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus, Ohio.

4-8 American Society of Mechanical Engineers, gas turbine-process industries conference, Shamrock Hilton Hotel, Houston.

16 Natural Gas Processors Association, Oklahoma regional meeting, Sheraton-Oklahoma Hotel, Oklahoma City.

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Natchez, Mississippi—Ph. 4795
Odessa, Texas—Ph. FE 2-9991
Oil City, Mississippi—Ph. 4615
Reed City, Michigan—Ph. Tenn-2-2461
Seminole, Oklahoma—Ph. 610
Shidler, Oklahoma—Ph. SWift 3-2011
Stephens, Arkansas—Ph. ST 6-5487
Vivian, Louisiana—Ph. 375-2018

SUPPLY STORES
B-H Pump Service, Seiman City, Tex. Ph. 5-2035
John & Paul Pump & Supply, Gladewater, Tex. Ph. 2777
Kemp Oil Well Supply, Gainesville, Tex. Ph. HO 5-5112
Mid States Machinery Co., Salem, Ill., Ph. 282
Midway Pipe & Supply Co., Groggton, Tex. Ph. PL 9-5114
Superior Iron Wks. & Supply Co., Tinsley, Miss. Ph. 403
W-B Pump & Supply Co., Pampa, Tex. Ph. MO 4-2223
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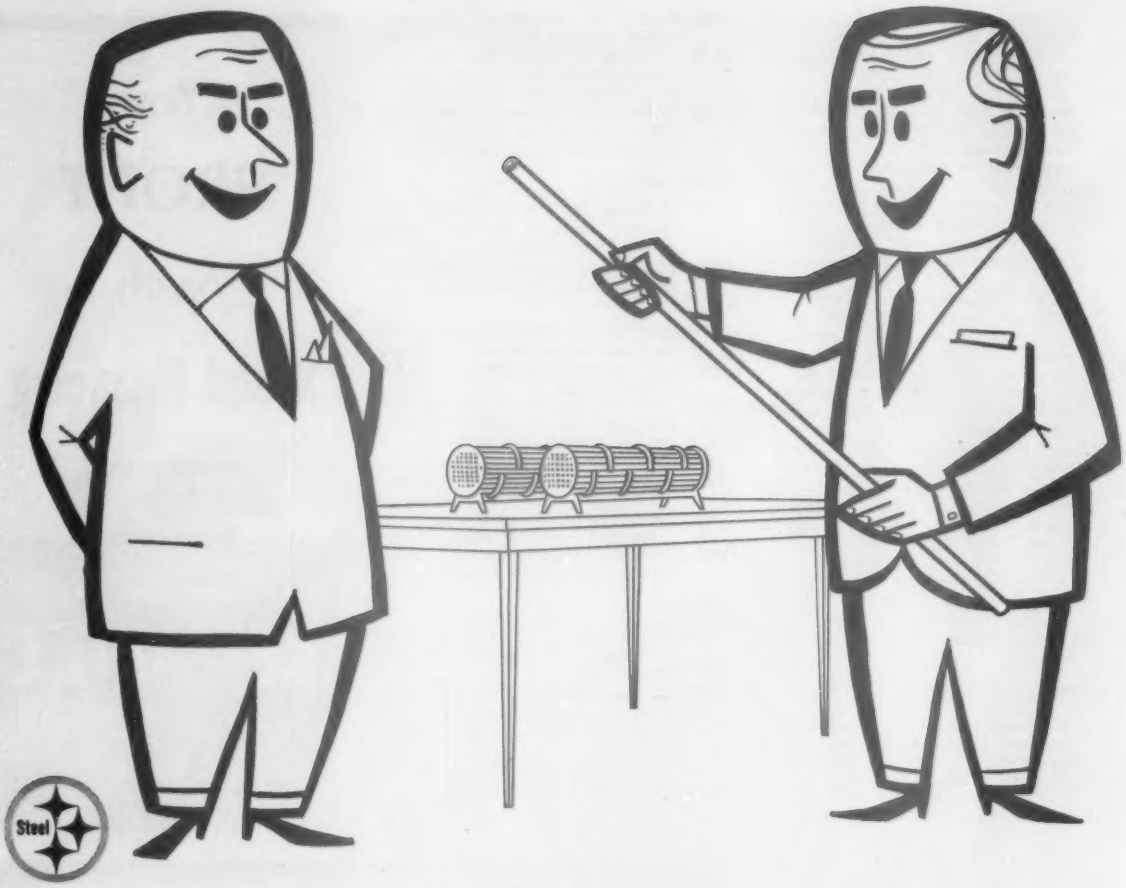

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50 years ago

August 31, 1911

A western refiner writes the Journal that he has compiled data which show that during 1910 there was consumed in automobiles gasoline to the amount of 103,984,000 gal. At present gasoline contracts are being made at 7⅞ cents per gallon.

Information from western fields is to the effect that Wyoming will not cut much figure in oil developments for a long time to come. There seems to be no necessity for operators to take any special interest in Wyoming or any other western field.

25 years ago

August 27, 1936

Beecher Island is an unimpressive spot on the prairie in eastern Colorado, 6 miles west of the Kansas line and 15 miles south of Wray, Yuma County. The Indian Territory Illuminating Oil Co. is drilling two wells in that territory. The one at Beecher Island is 1 Mildred Strangeways in C NW SW 21-2s-43w. The other is on the Hyde block, 40 miles west in Washington County, the 1 George Vorce in C NE NE 28-1s-49w. These are the first tests to be drilled following the leasing of more than 3,800,000 acres by the oil companies in eastern Colorado. The outcome of these wells will make or break one of the country's greatest wildcat plays.

10 years ago

August 23, 1951

Great Lakes Pipeline Co. started truck and tank-car deliveries August 20 from its Fairfax, Kans., terminal, the first since Black Friday floods shut down the terminal on July 13. On July 14 the Missouri River dike broke, flooding the entire Fairfax industrial district with more than 13 ft. of water.

The tidelands controversy may have quieted drilling in the Gulf of Mexico, but it hasn't put the damper on overwater drilling. Seventeen drilling barges are operating in bay waters of two South Texas counties and indications are that there will be more than 20 before the year is over.

A request to employ 80-acre well spacing in a portion of the vast Spraberry trend of West Texas was denied in Austin last week by the Texas Railroad Commission. All Spraberry drilling in the area has been on a 40-acre basis. Several major companies had joined the applicant, Magnolia Petroleum Co., in a steel-conservation move seeking wide spacing in Midland, Glasscock, Reagan, and Upton counties along the Spraberry trend where Magnolia has large holdings.

JOURNALLY SPEAKING

English Spoke Here

THE OTHER DAY we were called down by a public-relations man for Socony Mobil Oil Co. for putting a hyphen between the first two words of the company name.

He should have known better than that, because a columnist can always have the last word. And we are just ornery enough to turn the tables by pointing out one of Socony's own linguistic errors.

Down in Pecos County, West Texas, Socony's operating subsidiary, Mobil Oil Co., discovered a gas-condensate field, and so had the privilege of naming it. With pardonable pride it chose to immortalize its trademark, the Flying Red Horse, and the same time to bow to the local Mexican culture. But with unpardonable license it christened the field Rojo Caballos, which it says is Spanish for red horse.

Now even a gringo ought to know that in Spanish the noun always comes before the adjective (horse red), and that a plural noun requires a plural adjective. If they're talking about just one red horse the proper translation is caballo rojo. Yet they see rojo when we misplace a measly hyphen. We shudder to think of the linguistic violence that might have been perpetrated if Mobil had tried to put the whole "flying red horse" into its Texas-style Spanish.

But Mobil isn't the only oil company that has language trouble.

Up in Alaska there is a town named Soldatna, which is the Russian word for "soldier," and which has had that name since the United States bought Alaska from Russia. It's spelled that way by the U. S. Post Office and on all the maps. But when oil was discovered nearby the oil companies (we haven't been able to identify the culprit) insisted on spelling the name with an "o"—Soldotna—possibly because it is a phonetic rendering of the way the word should be pronounced. So now we have Soldotna field at Soldatna, Alaska. You figure it out.

Then there is that hot new area in Montana known as Tule field. Tule is a Spanish word for cattails or bullrushes, and it's pronounced toó-lee. But all the oil men in these parts refer to it as "Tool" field. Perhaps all oil men ought to take a course in language even if they aren't going to be sent abroad.

We can understand how oil men might have trouble with Vermilion (one l) Parish in Louisiana and Vermillion (two l's) County in Indiana; or with Unitah (with an h) County in Utah versus Uinta (no h) County, Mountains, and basin in Wyoming. But there is little excuse for the redundant "Rio Grande River."

And then of course there's the classic Glenn Pool, Glenpool, or Glen Pool Field—but let's not go into that again.

We now come to Cities Service, which, alone, sticks obstinately to the obsolete spelling "gasolene" although everybody else long since abandoned it for "gasoline" (but don't ask us why).

But we shouldn't be so smug. The Oil and Gas Journal insists on writing "kerosine," although the dictionary says "kerosene" is proper and nearly everybody else spells it with an "e". (Again, don't ask us why.)

Also, the dictionary says "benzene" is a product of coal tar whereas "benzine" is a petroleum product, but the Journal ignores this technicality and uses "benzene" indiscriminately for both products. (Consistency is the hobgoblin of little minds.)

Getting back to hyphens in company names, we are supposed to remember that Burmah-Shell and Standard-Vacuum have 'em but California Texas and Socony Mobil don't. And never to confuse British American (unhyphenated) Oil Co. with its subsidiary British-American (hyphenated) Oil Producing Co. No wonder editors get gray hairs.

Sometimes we long for a universal authority on style, spelling, and punctuation. But we know oil men would never follow it. And we probably wouldn't either.

—*Henry D. Ralph.*

An advanced new packer for production and well-stimulation

THE *BAKER* MODEL "R" DOUBLE-GRIP RETRIEVABLE CASING PACKER

A long-stroke (30″) packer with simple one-turn right control-pin setting, automatic bottom and hold-down... for combination acidizing, fracturing and production operations.

Now Baker brings new convenience, new reliability, to the familiar long-stroke production packer with hold-down.

This results from a new design concept that moves the hold-down from the tubing to the packer, placing it below the bypass valve. This restores surface control of the bypass valve for pressure equalization, eliminates button dulling, and provides dependable release of the hold-down.

And, back of the Model "R" is the Baker service organization. Domestically, 62 Baker field-service warehouses stand ready to supply packers, parts and repair service. Ask one of the 400 Baker servicemen to give you the complete story on both the Double-Grip and Single-Grip (no hold-down) versions of the Model "R" Packer.

NEW
Face-Seal Bypass Valve
Seals instantly, is non-plugging

NEW
Differential Lock
Locks bypass valve closed; unlocks when tubing is picked up

NEW
Integral Hold-Down
Holds packer down, but does not interfere with use of bypass valve

Proven 3-Element Packing System

Dependable Rocker-type Slips

NEW
Automatic Bottom
Locks slips in retracted position when tubing is picked up

PRODUCT 642-R

HERE'S HOW THE NEW DESIGN CONCEPT WORKS...

(1) Note that the *Bypass Area* through the packer is completely isolated from the packer mandrel and tubing. Pressure surges in the tubing cannot dull buttons while running in or retrieving. Solids in tubing fluid cannot compact behind buttons and prevent retraction.

(2) Note that the *Hold-Down* is a part of the packer, not attached to the mandrel... leaving the bypass valve free for instant pressure equalization.

(3) Note that a *Differential Lock* holds the bypass valve closed without requiring high set-down weights... yet can be instantly released by picking up on the tubing.

The new concept in long-stroke packers is fully explained in Bulletin 385. Write: Baker Oil Tools, Inc., P. O. Box 2274 Terminal Annex, Los Angeles 54, California

BAKER
BAKER OIL TOOLS, INC.
HOUSTON / LOS ANGELES / NEW YORK

Gasoline market wars endanger crude prices

MEMORIES ARE SHORT in the oil business. It was little more than a year ago that Derby Refining Co. cut the price of crude oil in Kansas because gasoline price wars in its area reduced its margin below the profit level.

That sent a shock through the entire industry, and brought corrective action. It brought home the elementary fact that the market value of crude oil depends on the price obtainable for its products.

Today price wars are more widespread and more severe than ever. Product prices in general are soft. Some refiners are having trouble in keeping red ink off their books.

WILL THE CRUDE PRICE BE CUT? The laws of economics suggest that it may. So do the laws of the jungle—the laws of cutthroat competition which characterize gasoline marketing today.

Nobody in the industry wants to see a lower price level for crude oil. But in desperation some refiner whose own crude production is small in relation to his refining capacity may reduce the price of his raw material to offset the erosion of his product prices.

He may hope and intend that his crude-price cut will be confined to his buying area and be restored shortly—as happened with the Derby cut in Kansas. But price cuts are apt to spread, with crude as with products. If one refiner gets an edge in lower raw-material cost, his competitors may use the same tactic.

It has often been charged by independent refiners and marketers that integrated companies subsidize marketing losses from production profits. This may have happened, though there doubtless are as many instances where marketing profits have subsidized unsuccessful wildcatting programs.

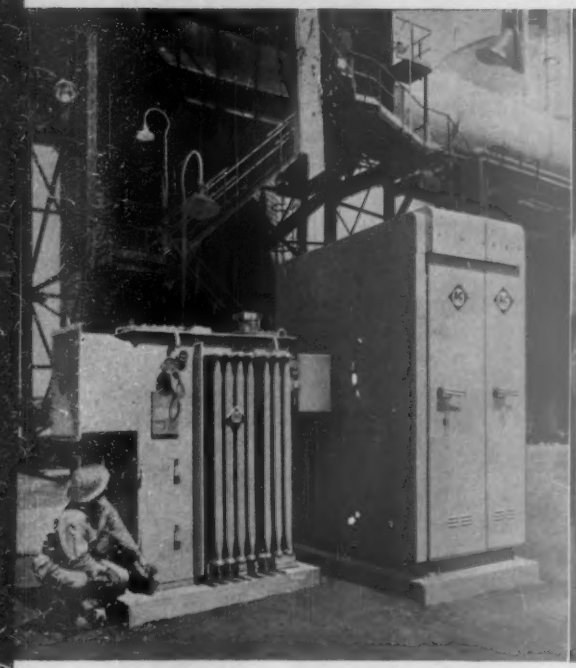
But, like the fruit stand that makes up on the coconuts what it loses on the bananas, a large integrated company can stand marketing losses longer than a small refiner with little or no crude production.

So with all the price cutting going on today, the cry for divorcement legislation may be raised again, with charges that the majors are plotting to run the independents off the map. There probably is no such intent, but the effects of today's market raiding could give that impression.

A GENERAL REDUCTION in the price of crude would be disastrous for the industry. So would divorcement legislation. But both are being invited by marketing wars.

The solution is to hold refinery runs down to actual demand; quit pricing surplus products at their incremental manufacturing cost; quit trying to undersell everybody everywhere; and quit trying to increase gallonage where the only way to do it is to run competitors out of business.

ideas and news:



Unit substations are "packaged" for lower costs: Allis-Chalmers packaged unit substations reduce your engineering, planning and purchasing time—cut installation and maintenance costs, too. Located close to the load center, they provide reduced power losses, better regulation, flexibility for expansion. Oil-filled, CHLOREXTOL liquid-filled and sealed dry-type transformers are available.

By-product power from process steam: Steam is used twice in this ethane cracking plant. It enters the 6250-kw WA-Series steam turbine-generator units at 625 psig. Steam at 65 psig is automatically extracted for use as process steam in the cracking operation. An unusually simplified control and hydraulic valve-actuating amplification system minimizes maintenance and improves performance of these units. Allis-Chalmers complete line of turbine-generators includes condensing and non-condensing types in ratings of 2000 kw and larger.

Which of these productive ideas could be working for you?

Motor controls that are safe in hazardous locations. Open motors that "thrive" outdoors. Efficient pumps for volatile liquids. These examples demonstrate the extra value that is standard with A-C ...the greater efficiency and the added productivity which are yours when you buy A-C products, systems and services. Call your Allis-Chalmers representative for details on A-C "worth-more" features. Or write Allis-Chalmers, Milwaukee 1, Wisconsin

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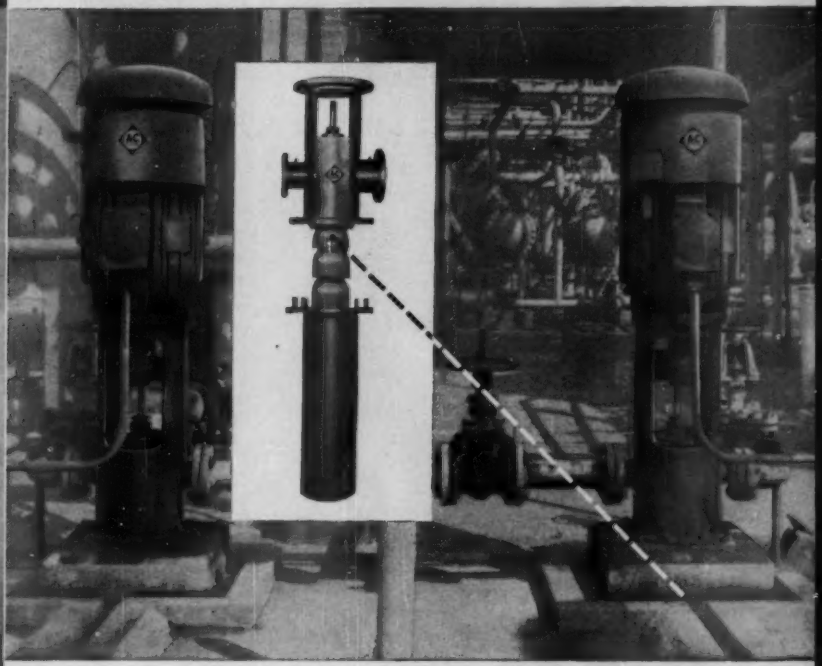
For your hazardous and semi-hazardous locations: A-C offers the most complete line of modern oil-immersed 2 to 5-kv motor controllers available. Units are available for any indoor or outdoor Class 1, Group D, Div. 1 or 2 application. High interrupting capacity fused units are also available for Div. 2. Unrestricted access to contactors and relay equipment simplifies inspection and maintenance. Contactors are rated 400-amp, 50-mva interrupting capacity for heavy-duty performance.

Short lesson on pumping volatile liquids: Use UNITANK pumps. These vertical turbine pumps are often the solution to NPSH pumping problems. Mounting of the impellers and bowl assemblies within a suction tank assures that impellers are always submerged . . . prevents fluids from vaporizing. Total dynamic heads from 20 to 400-plus feet are available, capacities from 20 to 3500 gpm.



Open motor's at home on the range: This SUPER-SEAL open motor fights off prairie dust (and rainstorms, too), thanks to remarkable POXEAL insulation. This Allis-Chalmers development enables open motors to resist dust, moisture, abrasives and contaminants. And the open design of SUPER-SEAL motors gives a higher service factor than TEFC types.

ALLIS-CHALMERS PRODUCTS FOR THE PETROLEUM INDUSTRY: Look to Allis-Chalmers for controls, rectifiers, switchgear, transformers, capacitors, circuit breakers, industrial systems, motors, pumps, compressors, valves, engine-generators, water conditioning equipment, thermal, hydro and atomic electrical generating equipment, earth moving equipment, tractors, lift trucks.

ALLIS-CHALMERS

If you formulate or use paraffin coatings...

Charts like these have been plotted for 18 ternary (3-component) systems containing two Epolene resins (E-10, E-11, E-12, N-10, N-11, N-12, C-10) and a standard 130° AMP paraffin. In each system, the tensile strength and adhesion ratings are given for combinations of the two Epolene resins varying from 0 to 2%.

Eastman can help you achieve optimum performance with the right blend of polyolefin modifying resins

A paraffin coating formulation containing a combination of polyolefin modifying resins, rather than one resin alone, will most often provide the optimum balance between such important coating properties as tensile strength and adhesion.

To aid you in obtaining optimum properties for specific paraffin coating applications, Eastman offers seven basic types of low-molecular-weight polyolefin resins.

The properties of hundreds of paraffin-polyolefin blends have been precisely determined by our chemists. Much of this information is now available in a series of easy-to-use charts. Your local Eastman representative will be glad to bring over these charts and help you find the most efficient and economical combination of paraffin and Epolene for your requirements. Call him in and see how helpful he and his charts can be.

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SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tennessee; Atlanta; Boston; Buffalo; Chicago; Cincinnati; Cleveland; Detroit; Greensboro, N. C.; Houston; Kansas City, Mo.; New York; Philadelphia; St. Louis. **Western Sales Representative: Wilson & Geo. Meyer & Company,** San Francisco; Los Angeles; Salt Lake City; Seattle.

Oil's Foreign Investment to Stay High

• U. S. companies will spend more than $1.75 billion abroad this year, and next year's total is expected to be a little higher. Survey shows petroleum foreign investment tops that of all manufacturing industries.

A SUBSTANTIAL upswing in plant and equipment expenditures abroad by U. S. petroleum companies is anticipated this year and in 1962, the U. S. Department of Commerce reports.

A compilation released recently by the Department's Office of Business Economics shows the industry is planning to spend more than $1.75 billion abroad this year and almost $1.8 billion in 1962.

The 1961 estimate is more than $300 million above estimated expenditures made in 1960, although it is short of the peak year of 1957 when such expenditures totaled over $2.3 billion.

Much of the increase will be in the Eastern Hemisphere, where the 1961 increase over 1960 will be about 30%, compared to a rise of less than 10% in Western Hemisphere investments.

The shift in these outlays emphasizes the development of new producing areas in North Africa and of improved refining and distribution facilities in Europe, a Commerce Department economist explains.

The increase in petroleum outlays for plants and equipment will make up a substantial portion of the over-all increase in such spending abroad by all U. S. industry and business.

The Commerce survey shows total expenditures for plants and equipment abroad by major industries will be almost $4 billion in both 1961 and in 1962, an increase of more than $700 million over 1960—including the $300 million increase in petroleum spending.

U. S. oil dominates the field of foreign investment by all manufacturing and extractive industries. In 1959 and 1960, fully one-third of all capital invested abroad by these major groups was in the hands of large international and small independent oil companies.

Moreover this ratio is rising. Oil companies are providing 44.7% of all new capital flowing abroad this year from U. S. manufacturing, petroleum and mining and smelting interests. Next year oil's share is expected to move up to 45.9%.

The current petroleum investment figures are not broken down by industry segment. However, Commerce Department last year published the results of a 1957 census of U. S. business investments in foreign countries and a breakdown by oil industry segments was given.

It showed that of $12.8 billion in gross fixed assets of petroleum en-

What U. S. oil companies are spending abroad

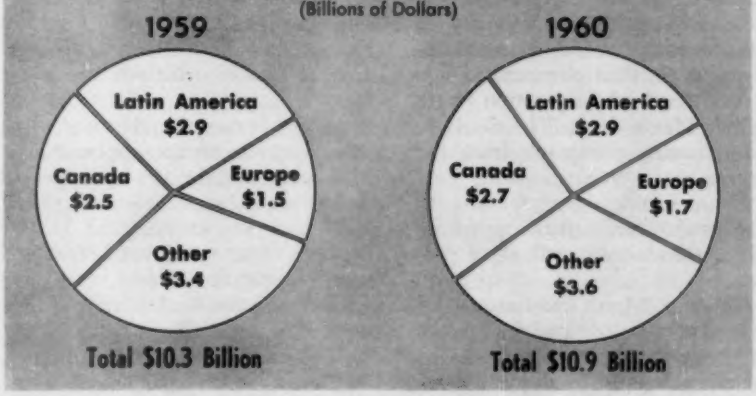
(Plant and equipment expenditures in millions of dollars)

Area—	1957	1958	1959	1960	1961*	1962*
All areas	$2,322	$1,834	$1,558	$1,467	$1,776	$1,794
Canada	584	430	380	360	375	365
Latin America	1,039	548	449	340	379	390
Europe	275	414	339	345	469	479
Other areas	424	442	390	422	553	560

*Estimates. Source: U. S. Department of Commerce, Office of Business Economics.

Where U. S. Oil's Foreign Investment Dollars Go

Value of U. S. Direct Foreign Investments
(Billions of Dollars)



terprises abroad in 1957, 49% was in production, 17% in refining, 13% in marketing, 11% in tankers and other equipment, 7% in pipelines, and 3% was in "other and unallocated."

In another report, issued last week, the Office of Business Economics shows the value of direct U. S. petroleum investments abroad totaled $10.3 billion in 1959 and rose to $10.9 billion in 1960.

The 1960 petroleum total included $2.7 billion in Canada; $2.9 billion in Latin American republics, including $2.6 billion in South America, and $2 billion in Venezuela; $1.7 billion in Europe, including $600 million in the United Kingdom; $1.1 billion in the Middle East; and $536 million in the Far East.

The Government economists making the report noted that most of the total new U. S. capital moving into Canada in 1960 went into the mining and petroleum industries while the investments in manufacturing industries were financed primarily through reinvested earnings and other internal sources of funds.

The outlook for 1961 and 1962, the economists said, is that petroleum investments in Canada will continue at about the 1960 pace.

Petroleum capital outflows from the U. S. were $455 million in 1960, although capital returns to the U. S. from Latin America exceeded the outflow by $7 million. This, the economists said, was caused by the low level of new activity by the U. S. petroleum industry there. Also, part is attributable to Cuba, where the flow of capital from the U. S. has virtually stopped.

In earnings, petroleum showed the most gain in the Middle East.

Total earnings abroad for U. S. oil firms was almost $1.3 billion in 1960.

Don't Count Out Area Gas Pricing Yet

- Producers tell FPC it's too early to say the method won't work, and Chief Examiner Marsh modifies his recommendation that the idea be abandoned.

THE chief hearing examiner of the Federal Power Commission has toned down a suggestion that the FPC consider abandoning the area-wide pricing approach.

The examiner, Edward B. Marsh, made the change in a proposed report he had written for presentation to the commission (OGJ, Aug. 14, p. 84).

He had circulated the proposed report to parties involved in the prehearing conference on area-wide rates for southern and offshore Louisiana to get their comments.

As a result of the reaction he received, Marsh decided to eliminate the following paragraph from the report:

"I am unable, in all fairness, to recommend the further pursuit of the area-wide rate method of procedure."

However, Marsh did leave in his final report a section calling the commission's attention to "serious questions as to the legality and practicability of the area-rate determination."

He said he was doing this in the event the commission "should wish to reconsider the action which it has taken with respect to area rate-making proceedings."

He also deleted a paragraph in which he had recommended to the commission that the FPC staff be directed to prepare documents and take other necessary steps to obtain data required for use of a "pay-out" method of initial rate determination.

He said the comments of the participants had persuaded him of the impracticability of such a recommendation.

However, Marsh did call the commission's staff specifically to a suggestion by the staff counsel that in the absence of evidence calling for a contrary result, the commission should accept the June 7, 1954 rate level for the southern Louisiana area, at least in certificate proceedings.

Such a move would apparently leave to producers the responsibility of showing why the 1954 price level should not be applicable now. (The 1954 date was the day the U. S. Supreme Court ruled that FPC must regulate producer sales).

Marsh, in the final version of his report last week, also suggested that the commission set a hearing date for December 15, to be preceded by a conference November 30.

Marsh's revised report has now gone to the commission, thereby leaving the next step in the area-wide pricing issue up to it.

Producer reaction . . . A number of producers, including many majors, had reacted strongly to Marsh's initial viewpoint that the area-wide price approach appeared virtually hopeless.

One statement, submitted jointly by 29 producers, said that the producers felt it was far too early to decide whether area-pricing would be a workable method of regulation or not.

They urged the commission to give area-pricing a fair trial and pledged to cooperate in such an attempt.

They conceded that many problems confront area-pricing but said that was not sufficient reason for giving up on it at this stage.

They attacked sharply the "pay-out" approach—suggested tentatively by an FPC staff member—which would use 1954 as the base in determining producer profitability. This level of profitability would then be applied to new production coming into the market.

"Implicit in that method is the assumption that gas prices were just and reasonable in 1954," the producers commented, "but the only real evidence available indicates the contrary."

Also, they said, the FPC staff's method seeks to determine the average profitability for 1954 for the purpose of fixing a ceiling in 1961.

"This procedure could not help but reduce the industry's over-all profitability below that which was experienced in 1954 when natural gas was in oversupply and was selling at unrealistically low prices," they said. There were other com-

ments on the area-pricing issue:

. . . Shell Oil Co., in a separate statement, agreed with the other producers that the area-wide approach should not be abandoned.

It said that producer "caution" in the prehearing conferences was a natural thing and was not a device to obstruct the proceeding.

Shell made it clear, however, that it does not feel that area prices should be based on area costs alone. Instead, it suggested that the commission might better determine the financial requirements of the industry on a more meaningful basis through an industry-wide or national hearing.

. . . Sun Oil Co. took a flat-footed stand against any joint presentation of evidence by producers.

"Sun reserves its individual right to make a full and complete evidentary presentation in support of its contract prices," the company said.

Sun said it doesn't want "mass determination" of rates by reference "to some vague and indefinite area price."

It wants Marsh to recommend dismissal of the area proceedings entirely, or at least dismissal of the portion involving Sun.

. . . United Gas Improvement Co., a distributing firm, recommended "further pursuit" of the area-rate method and urged the commission to provide further guidelines.

Staff position . . . The staff agreed with the examiner that "no progress" was achieved during the prehearing conference and that "most" of the participants had shown no intention of abiding by an area-rate determination "regardless of the evidence."

But the staff disagreed with the examiner's suggestion that the commission provide more specific guidelines as to types of evidence and data needed in area-pricing proceedings.

"It is not the commission's duty to guide and clarify this proceeding to the point of telling the parties what their evidence and arguments should be," the staff said.

The staff said it felt that the producers did not want to commit themselves as to evidence and data because "they still do not know what contentions the data they are now collecting will support."

Watching WASHINGTON

Clyde La Motte

• Is Steed's committee launching a fuels policy study? . . .

THERE is the distinct feeling on the part of some that Rep. Tom Steed (D.-Okla.) has thrown the oil industry something of a curve.

The agitation stems chiefly from the fact that coal has now been included in the study Steed's House Small Business subcommittee has launched. To the disgruntled, this smacks of a fuels policy study, thinly disguised.

You will recall that when Rep. Wright Patman (D.-Tex.), chairman of the parent committee, originally announced the plan for the Steed subcommittee study, he talked almost entirely of the need for a close look at the import quotas granted to inland refiners.

However, plans for the study broadened out from there until it now includes virtually every phase of the oil-import-control program. And, finally, coal was drawn into the picture, too. That was when some hackles began to rise.

It could well be that the major importers were never too eager about the Steed study anyway. They may suspect that Steed's principal interest is in domestic oil producers, particularly the smaller independents. If so, they reason, it's a good bet that the subcommittee will find a need for further restrictions on imports.

• Jack Evans is heading up a new fuel-oil organization . . .

AN OLD face in Washington is currently showing up at a new stand.

J. K. Evans, formerly Asiatic Petroleum Co.'s Washington representative, is now executive director of Independent Fuel Oil Marketers of America, Inc.

IFOMA is a new organization made up of independent terminal operators along the East Coast. The No. 1 target of the group currently is to get controls of residual fuel oil imports abolished. Failing that, they hope to get changes in existing regulations to give them a better break on import quotas.

Back to Evans: It can be assumed that his decision to retire from Asiatic last month was hastened along by the unpleasantries that cropped up as a result of the fund-raising letter he wrote to Washington oil representatives earlier this year.

In the letter, Evans said Interior Secretary Stewart Udall had asked him to hit up the oil boys in town to buy tickets to a Democratic party dinner honoring President Kennedy. Udall subsequently said he had not intended for Evans to make such a broad-scale effort.

Both Evans and Udall became disgruntled, and Asiatic may have too, although the company has kept silent. Anyway, Evans, whose 28 years with the company entitled him to retirement, decided to step out.

In addition to his new job with IFOMA, Evans will do consulting work in international fields, including oil.

• Visit by Russian gas delegation to U. S. delayed . . .

Plans for a September visit to the U. S. by a Soviet Union gas delegation have been changed. The tentative new arrival date is November 12.

Originally, the Russians were scheduled to arrive in New York on Labor Day, then to proceed to Washington for a visit of 2 or 3 days, including a tour of the Federal Power Commission. However, last week as U. S. hosts got ready to greet the visitors, the plans were changed.

SIGNAL exploration chief Russ Green ends tour of town-lot area, at left.

New Town-Lot Play Scheduled in Los Angeles

• Three companies plan a metropolitan wildcat program on a 1,000-acre tract involving 4,000 separate leases.

A WILDCAT drilling play in the residential area of west Los Angeles is planned by three companies long active in the town-lot oil hunt.

Pooling their holdings, which total 4,000 leases covering 1,000 acres, are Signal Oil & Gas Co., operator of the joint venture, Richfield Oil Corp., and Continental Oil Co. Conoco holds 50% interest in the venture and Signal and Richfield 25% each.

The unit agreement setting up the new drilling area is the result of months of work by the three firms. Most of the area was signed up during an intensive leasing campaign late in 1959. Signal now is ready to file for a drilling district permit, which will be followed by a wildcat in 2 or 3 months.

Another wildcat in the same general area of Los Angeles spudded recently and is drilling ahead below 4,783 ft. The test is a joint venture of Signal and Union Oil Co. The rig is set up near Western Avenue and Adams Boulevard about 5 miles west of the three-company acreage. The wildcat is the 1 Murphy in Sec. 2-2s-14w.

These two wildcats are two of six that may be drilled in metropolitan Los Angeles this year (OGJ Newsletter, July 17).

New acreage . . . The Signal-Richfield-Conoco acreage is just west of two good town-lot producing areas.

Universal Consolidated Oil Co. is making 3,000 bbl. daily from 30 wells on its 20th Century Fox lease. And Signal and Richfield are producing 6,200 bbl. daily from 22 wells on their holdings at Hillcrest Country Club and Rancho golf course.

The Culver City holdings of Continental are about 2 miles to the southeast of the three-company acreage. Conoco has one well producing at Culver City and has farmed out part of the acreage to Standard Oil Co. of California.

Boundaries of the new district area: Santa Monica Boulevard on the north; Kelton Avenue on the east; Exposition Boulevard on the south; and Centinela Avenue (the Santa Monica city limits) on the west.

Cities Service Plans Big Helium Plant

CITIES Service has signed a contract with the government to construct one of the largest helium extraction plants ever designed in the United States.

This is the second contract Interior Department has made with a private company recently to build helium-recovery facilities. First was with Helex Co., a subsidiary of Northern Natural Gas Co. (OGJ, Aug. 21, p. 65).

Interior said last week that two other contracts are being negotiated. They are with Helium Conservation Corp. of Midland, Tex., and Panhandle Eastern Pipe Line Co., Kansas City, Mo.

In addition, Interior said, it has offers from 10 more companies wishing to build plants—and it invited offers for any other interested companies. All in all, the government is seeking to get 12 such plants built.

The contract signed last week with Cities Service Helex is for 22 years and provides for government purchases of up to $9.1 million worth of helium annually.

The plant will be built near Ulysses, Kans., to process 505 million cubic feet daily of gas now being transported by Cities Service Gas Co. from the Kansas-Hugoton field.

The plant is expected to be in operation early in 1963.

The government will pay the company $11.78 per thousand cubic feet of helium, which will be carried by government pipeline to underground storage at the Cliffside gas field at Amarillo.

Fewer Security Analysts Rate Oil as a Growth Industry Now

- **Oil securities still favored by investors looking for dividend income. Natural gas is high on growth list.**

THE oil industry's growth prospects, as viewed by influential security analysts, have dropped sharply during the past 2 years.

Of the 50 specialists in oil securities interviewed in a recent survey, only 8% considered oil securities among the most attractive for growth potential over the next 5 years. This was a decline from oil's status with security analysts in 1959 when 21% rated the industry high from a growth standpoint.

The two surveys were conducted by Opinion Research Corp., Princeton, N. J. The first interviews were made in December 1958 and January 1959. The second interviews came in January and February 1961.

The first survey reflected a carryover of popularity from earlier postwar years when oils were the most glamorous of the growth stocks. But the post-Suez crisis recession had already begun to take its toll on oil's image. The second survey appeared to give little long-term weight to the big recovery of 1960.

However, higher earnings, together with depressed prices of common stocks make oils one of the favorite issues among investors seeking income from dividends.

Oils were rated a tie for seventh in the 1958-59 growth survey. They dropped to a tie for twelfth in 1961 (see table). Oil's deterioration in the eyes of the analysts was second in magnitude only to the chemicals, whose explosive growth has been marred by price cutting.

Natural gas, meanwhile, fell from fifth to seventh place. Still, with 33% of the security analysts remaining bullish on natural-gas stocks, the standing of oil's Siamese twin continues to be relatively high.

What happened? . . . In explaining their views on the future of oil, the analysts generally cited the slackened growth in demand, the worldwide oversupply, excess U. S. refinery capacity, and competition from gas and electricity.

In addition to these factors affecting growth prospects, two others loom fully as large if not larger in shaping opinion:

. . . Lack of confidence in management's ability to live with excess capacity without slipping into ruinous price wars.

. . . The specter of Russia as a threat both to the markets of international oil companies and the crude-oil price structure as well.

Survey replies also included rather vague worries about fuel cells and atomic power. The assumption of analysts seems to be that any fuel cell that becomes commercial will use a nonpetroleum fuel.

But the most important factors which emerge, both from the survey replies and from a reporter's conversations with analysts, are surplus mismanagement and a Russian phobia. Of these, the most recurrent theme is the Russian "menace."

These representative appraisals of the industry's biggest problems reveal the pattern: "Threat of Russian competition. . . . Competition from Russia, Communist China, and the countries that lean to communism . . . Russia's use of oil as a diplomatic tool, and the industry's inability to practice statesmanship in its pricing activities . . . the possibility of management failing to maintain a proper balance of supply and demand."

One analyst went so far as to predict: "The question in the Middle East is whether or not Russian oil will replace its market."

It may come as a surprise to the oil industry that it can expect competition from Red China, which imports oil from the Soviet Union. Moreover, Russia in its most optimistic moments talks about gaining 7.5% of the noncommunist world demand outside the U. S. and Canada by 1965.

One oil-company official observed that the industry had gone from regarding Russian oil as bugaboo to facing it as a reality which is troublesome, mainly because of price cutting, but not nearly so frightening. The financial community, he added, has not passed the "bugaboo" stage.

As to oil-industry management, analysts contacted by the Journal, in commenting on reorganization and cost-cutting programs, said in essence, "It was about time."

Oil's opportunities . . . The oil industry's best opportunities for growth, according to the survey, lie in increased diversification into petrochemicals, development of new uses for petroleum, and expansion of natural-gas production.

(One analyst, in the natural-gas survey, recommended that gas companies get into the oil business.)

Another respondent felt that one of oil's best opportunities is in diversifying outside the energy field—in other words, getting out of the oil business.

Natural-gas survey . . . Although natural-gas specialists are still high on this industry. they see many problems.

The main ones are competition from competing fuels, particularly

How Growth Prospects of Industries Compare

Security analysts were asked their opinion of the growth potential of various industries in a survey this year and in 1958-59.

Opinion Research Corp., Princeton, N. J., posed this question: "Which of these industries rates as one of the most attractive in terms of growth possibilities over the next 5 years?"

The results shown are a percentage tabulation of the answers.

Industry	1961 Survey (%)	1958-59 Survey (%)	% Change
Electrical equipment, electronics	81	86	− 5
Office equipment	71	58	13
Drugs	61	62	− 1
Communications	48	15	33
Utilities (mainly electric)	47	21	26
Chemicals	39	59	−20
Natural gas	33	42	− 9
Food (mainly processing)	25	9	16
Banks	15	4	11
Building materials	14	15	− 1
Paper	9	22	−13
Petroleum	8	21	−13
Aircraft	8	14	− 6
Metals	5	12	− 7
Rubber	3	11	− 8
Steel	2	14	−13
Automobiles	2	2	....
Rails	1	1	....

electricity, and regulation. Analysts spoke with one voice in singling out the biggest problem. They described it variously as:

"The Kennedy administration and its effect on the Federal Power Commission . . . Stupid centralized United States policy . . . Federal Power Commission regulation." Another more philosophical observer cited "problems with the regulatory agency, but they always seem to overcome them without any serious consequences."

No one appeared to consider supply a limiting factor on growth.

Opportunities, according to the survey, include petrochemicals, development of a major air-conditioning load, and plug-in gas appliances based on converting gas-flame heat into electricity.

Court Approves Permit to Drill on Separated Townlot Tract in Texas

A TEXAS appeals court has held that an operator is entitled to a drilling permit on each townlot tract he owns provided they do not adjoin.

The ruling, by the Third Court of Civil Appeals, upheld a Rule 37 exception granted an Appell Petroleum Corp. well in Fulton Beach field of Aransas County. The permit from the Railroad Commission was attacked by Coloma Oil & Gas Corp.

In the particular situation, Appell held a single lease covering three adjoining and one separated tracts in Lamar townsite. The lease includes a provision that production on one tract holds the lease on all four.

Appell already had drilled a well on the three-lot block and was granted a permit for another on the isolated tract about 200 ft. away.

Coloma, with a well drilled between the Appell tracts, tried to invalidate the permit on grounds that the owner of the land and lease, not the tract, has the rights. And these rights, it claimed, are satisfied by a single well.

The court said these arguments were "novel and forceful" but not sound.

New Tanker Strike When

A COMPROMISE on the issue of bargaining rights on American-owned, foreign-flag tankers last week cleared the way for settlement of the maritime dispute which resulted in a strike June 15.

The Marine Engineers Beneficial Association came to terms with the Tanker Labor Services Committee, promising an end to the threat of a new walkout September 21 on expiration of the 80-day Taft-Hartley injunction.

Late last week there was still no agreement with the International Organization of Masters, Mates, and Pilots, which were demanding the addition of a fourth mate aboard tankers. However, with the foreign-flag issue out of the way, tanker owners were expected to come to terms with this second officer union.

The tanker group, representing 18 companies, signed tentative agreements early in July with the National Maritime Union and the American Radio Association. Contracts provided for a 21¾% increase in wages and fringe benefits over a 4-year period plus a study of the foreign flag issue.

Agreements were contingent upon settlement with MEBA and MMP. Federal mediators brought the disputing parties back together last week with only 30 days remaining under the injunction, which halted the strike July 3.

Foreign-flag compromise . . . Here is the formula which warded off a resumption of the strike, although it did not settle the question of American union representation on ships flying foreign flags, particularly those of Panama, Liberia, and Honduras.

. . . A union-industry committee was established to convene discussions on the foreign-flag issue. Other maritime unions and tanker operators whose crews are not represented by any of the AFL-CIO unions will be invited to participate, and are expected to join.

. . . If no agreement has been reached by Feb. 23, 1963, MEBA has the right to strike on the issue without violating the new contract.

This formula differs from the one between NMU and tanker owners which included the Government as a third party to the discussions.

What MEBA hopes for, it is understood, is legislation requiring that a certain percentage of oil and ore imports be reserved for U. S. flag vessels. This would mean a reversal of the decline of the U. S. flag fleet, provide more seamen's jobs, and perhaps take the heat off the Pan-Lib-Hon ships, the principal target of maritime unions in the contract dispute.

They have been further encouraged by the National Labor Relations Board contention that American-owned ships regardless of flag are subject to U. S. labor law if engaged in U. S. commerce. The NLRB has just extended this interpretation to cover foreign owned ships as well.

Also, MEBA has signed up another independent ship owner who has agreed to give the American union the chance to organize the company's foreign crews.

However, the major tanker operators, including oil companies, still hold that it is impossible under international law and for economic reasons to concede this point.

The Defense Department, which supports the Pan-Lib-Hon registry, because this fleet by treaty is a kind

INDUSTRY

Permian Basin Petroleum Association has been formed in Midland, Tex., to gather data for an October 3 FPC hearing on area-pricing in the Permian basin. Civic, local government, and petroleum industry representatives from several West Texas communities organized the association.

Opening round of a court fight to determine which of two companies will supply the City of San Antonio with natural gas over the next 20 years is slated for August 29 in Austin. United Gas Co. is asking a state court to order the Railroad Commission to take jurisdiction and decide whether United or a new firm, Alamo Gas Supply Co., will supply the city. United's contract expires Apr. 1, 1962. And the city

Cooling-Off Period Expires Is Unlikely

of ready reserve for the U. S., has expressed fear that American union control would result in transfers to European flags.

They would be beyond the reach of American unions, whose wage scales are four times those prevailing on European flag vessels.

Vessel transfer . . . Meanwhile, the possibility of a flight from the so-called "flags of convenience" or "flags of necessity" was raised under pressure of union demands to bargain for these crews.

A 70,000-ton Cities Service Co. tanker registered in Liberia was sold to a Dutch firm and its registry was transferred to the Netherlands. The sale appeared to be a direct result of the threat of U. S. unions gaining control of these ships.

The warning from industry and government sources of possible flag transfers seems to have been borne out by the Cities Service sale.

The supertanker Burl S. Watson this month appeared on the Lloyd's registry supplement under the ownership of Phs. Vanommeren N.V., Rotterdam. The Dutch company confirmed the purchase, and said a 15-year charter had been arranged with the oil company.

The Dutch tanker operator said negotiations are under way for still another Cities Service Liberian flag tanker, reportedly the W. Alton Jones.

One tanker transfer does not constitute a "flight" from the Pan-Lib-Hon flags, nor does two. But the development reveals the temper of tanker operators whose Pan-Lib-Hon flag operations, even if supported by one branch of Government, are becoming less tenable under recent NLRB rulings.

Showdown at hand . . . The unions, for their part, apparently feel they have no alternative but to force a showdown on the issue.

Since 1947, while the Pan-Lib-Hon tanker fleet has risen to 8,360,000 dw. tons, more than the entire U. S. flag fleet, the U. S. flags have declined by 50% and so has the number of seamen's jobs.

Tankers, ore and bulk carriers are not eligible for the subsidy under maritime law. The unions which represent the unsubsidized fleet, both dry cargo and tanker, fear further losses to foreign flags.

Their adamant stand seems to be aimed as much at the Government as at ship owners, with a view to forcing the President and Congress to face up to the facts of a declining American merchant marine. They want to expand the subsidy program and require U. S. oil traffic to be carried in American vessels.

Unless the Supreme Court nullifies NLRB decisions, the unions may succeed in winning a government review of maritime policy.

To bring these flags into the U. S. fleet and under the subsidy program, so they could compete with foreign tankers, would cost an estimated $500 million.

Taft-Hartley machinery . . . If the dispute isn't settled immediately, the three-man fact-finding board appointed by President Kennedy will report to him by September 1 on the status of negotiations and the substance of the latest proposals.

Then the NLRB will conduct a secret ballot on the employer offers. If no agreement is reached, unions could legally resume the strike September 21. In the interim, however, the Government—deeply involved in the dispute—may be expected to exert increasing pressure for a settlement.

Refiners have been running crude to stills at high rates and building heating oil stocks on the East Coast as a hedge against a resumption of the strike.

BRIEFS . . .

has contracted with Alamo Gas to take over from that date on a 20-year contract.

Seven more injection wells will be added to the Orco Process flood program that Helmerich & Payne operates in West Texas. The new wells will be drilled south of the presently flooded area. One purpose of the extension is to prevent possible oil loss to an associated gas cap.

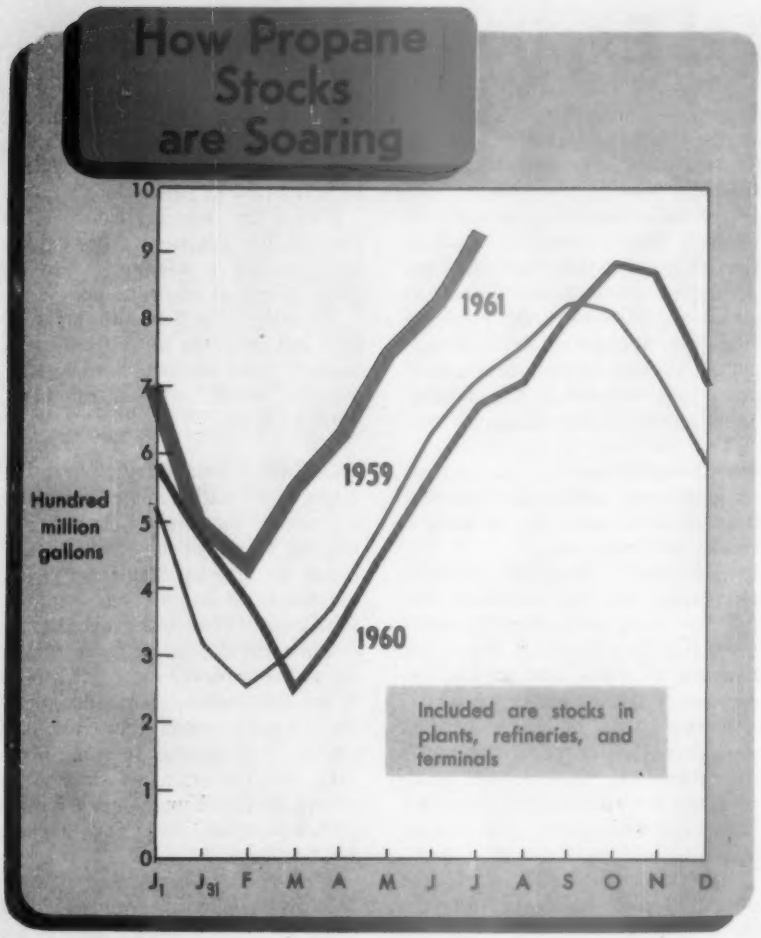
The Texas Railroad Commission will have $3,428,000 to run its oil and gas division over the next 2 fiscal years. The division appropriations were finally approved by the legislature just prior to adjournment. The commission's major expense is for salaries.

A stream flood in two reservoirs in Camp Hill field of Anderson County, East Texas, has been approved by the Texas Railroad Commission. The project will be operated by W. L. Long in sands at 200 ft. and 450 ft. in the Carrizo Wilcox formation. The 200 ft. reservoir contains 75 acres, and the deeper zone 800 acres. Plans are to inject a total of about 450 bbl. of water daily at a pressure of 50 psi. The steam process will be tested with two 1-acre pilots prior to starting full-scale flooding.

Acquisition of Cascade Petroleum Co., which owns North and West Texas producing properties, is planned by Pure Oil Co. Pure will exchange 170,582 shares of its common stock for Cascade's capital stock. The deal will be completed September 1. Cascade produces about 650 bbl. daily and has 22,000 undeveloped acres. Pure will operate the company as a wholly owned subsidiary.

Purchase of 26 wells in the Signal Hill area of Long Beach field in California from Socony Mobil was announced by Westates Petroleum. Production averages 150 bbl. daily of 24°-gravity crude. The companies also made an agreement whereby Westates will operate Socony's 15 remaining wells in Long Beach field and Socony will operate 21 wells Westates owns in Santa Fe Springs field.

Largest tanker in Socony Mobil's domestic coastwise fleet, the 46,962-ton Mobil Meridian, has completed her owner's sea trials. Built at the Bethlehem Steel Co. Shipbuilding Division, Sparrow's Point, Md., the tanker has a cargo capacity of 395,321 bbl. of petroleum.



It's a New Record Every Day

. . . for propane stocks from now until cold weather kicks up demand. Suppliers hope this winter is coldest ever.

PROPANE STOCKS have reached record levels, prompting wishes among suppliers for an early fall and unusually cold weather this winter to correct the oversupply.

Stocks of propane on August 1 totaled 941,280,000 gal. This is 50,342,000 gal. higher than the previous peak which came at the end of October last year.

Heavy production in the last half of July increased the propane inventory level by more than 55 million gallons, and this record buildup will continue until the end of September or well into October. In fact, it was mid-November last year before demand caught up with production and the growth of stocks.

Plant operators and refiners last year added 234,000,000 gal. to propane storage between July 15 and November 15. If they add that much this year, the peak this fall will exceed 1.1 billion gallons.

Weather factor . . . Marketers estimate that slightly more than 40% of propane demand depends upon cold weather.

Early fall weather thus would slow down the accumulation of stocks by prompting distributors to start moving supplies from primary storage into trade channels. Some suppliers estimate that a month longer of cold weather this season or cold weather reaching into the southeastern states would go far toward reducing high stocks.

This knowledge of how quickly chilly weather can equalize propane stocks is the basic reason why suppliers generally take a calm view of present high inventories. They also tend to view the increasing size of inventories as a reflection of industry growth and as necessary to serve growing markets. Capacity of underground storage to smooth out distribution peaks also is setting new records each year, requiring more product to stock them.

One marketer predicts that when the coming heating season is ended stocks will be only about 5% above normal. He also is counting on demand to prevent high stocks from breaking prices.

Price effects . . . Heavy inventories, however, have had a definite influence on propane prices this summer.

The Group 3 posted price has held at 3 cents per gallon, about 1 cent below normal, after price cuts in March and June. Spot prices have dipped to 2 cents with at least one broker reporting that spot propane had been offered at 1.75 cents for quick movement.

Some observers expect propane to recover from its 1-cent decline when activity starts picking up in September. And a cold spell in December could push prices back to the normal 5-cent winter level.

The buildup . . . One reason for current high stocks of propane is that cold weather didn't last long enough last winter.

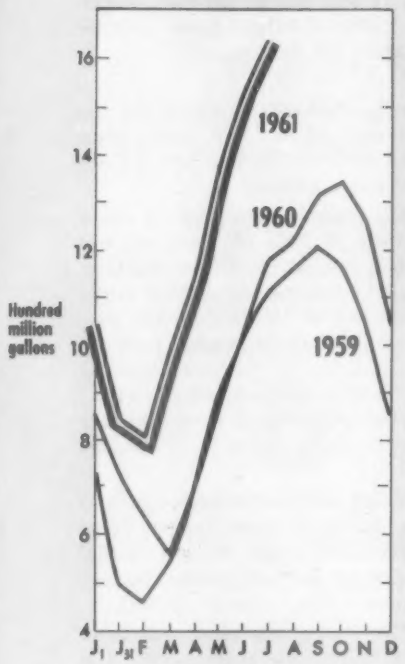
The big buildup started in March this year. In both of the previous 2 years the winter drawdown had continued until April. But this year propane stocks dropped only 5.4 million gallons in the last half of February, and actually increased 28 million gallons in the first half of March.

The total has been increasing at a near constant rate since, and will continue for at least 2 months longer.

Totals are up, too . . . Propane isn't the only product whose stocks are soaring.

All stocks of LPG and LRG now total 1,647,102,000 gal., up 298,653,000 gal. from last year's peak, which didn't come until the end of October.

Total LPG and LRG Stocks



Propane wouldn't pose the storage problem it does if other products were at normal levels. But all of the LPG and LRG requires pressure storage.

Butane stocks on August 1 were 119,000,000 gal. higher than the same date a year ago. Of this "extra" volume, 84,000,000 was at field-processing plants or in underground storage. The rest was in storage at refineries.

Stocks of isobutane, used for blending at refineries, were up 52,000,000 gal. from the same time last year.

LPG mixtures show a good percentage gain in inventories, but the over-all total is not large enough to be a major factor in the storage problem. Stocks amounted to 58,000,000 gal. compared with 36,000,000 gal. a year ago.

An early frost, followed immediately by a frigid winter, wouldn't displease LPG producers. The fact they're setting a new inventory record every day doesn't excite them. The only record that interests them now is a sales record—and the sooner the better.

TIPRO Sees Import Changes

- **Association thinks Interior is in the mood to revise controls and will be ready to offer quota-bidding plan.**

THE Texas Independent Producers and Royalty Owners Association is expected to urge the Interior Department soon to junk the present import-control program and adopt a new and "workable" one.

TIPRO directors have named a special imports subcommittee to study possible alternatives and come up with a proposed new program.

The reasoning behind the action is threefold. First and foremost, TIPRO is increasingly dissatisfied with the fact that imports' share of the domestic market continues to increase under the present program.

Secondly, the present program is coming under increasing pressure from actions in the courts and Congress.

And finally, the association feels it sees some indication from Interior that—due to this pressure—it is about ready to consider broad changes in the program.

Earl Turner, executive vice president of TIPRO, said the Texas independent group has strong reports that Interior plans to ask the industry this fall for its suggestions toward revising the import program.

These reports, Turner said, are that Interior will solicit the industry around the middle of September and give it about a month to respond with suggestions.

Quota-bidding system? . . . Turner said it's possible TIPRO may have its proposal for a new import-limiting program whipped into shape in 3-4 weeks.

Best guess now is that it will closely resemble the Ikard-Long quota-bidding plan (OGJ, April 7, 1958, p. 101).

TIPRO historically has pushed for the tariff approach for limiting imports by removing most or all of the cost advantage imported oil enjoys. But many in the organization have become convinced there is no hope of getting a big tariff through Congress.

The quota-bidding plan would accomplish about the same thing, they feel, without a tariff. Under this plan, the total market for imported oil would be set and then split up as to type of oil and source of supply. U. S. companies desiring to import would be required to bid for these quotas. The thinking is that the quotas would be bid up high enough to remove most of imported oil's price advantage over domestic supplies.

Confusion increasing . . . Following TIPRO's board meeting in Corpus Christi August 18, James F. West, president, said, "Confusion surrounding implementation (of the present program) has become so great that it holds little promise for achieving even the most minimum objectives for which it was created."

The program, he said, has failed to restrain imports in some proper relation to domestic production. "The exemption policy is clearly being abused. Some new rulings of the appeals board on so-called hardship cases will contribute further to instability . . . as will the court attack on the formula by one major importing company."

West said TIPRO will cooperate fully with the Small Business subcommittee of the House of Representatives in its imports investigation (OGJ, August 14, p. 78). He said it would provide facts and figures, and possibly "proposals for an alternative imports limitation program."

In other action, the TIPRO board voted to continue to press for more "equitable sharing of the domestic crude market among producing states, to oppose any change in tax treatment of ABC-type production sales by the Internal Revenue Service, and to intensify its support of area pricing for gas by the Federal Power Commission.

On market sharing, TIPRO said it is urging leading purchasing firms to make crude nominations "on some reasonable and equitable basis in all the states they serve. This in our judgment is the surest and possibly the only means of avoiding undue federal intervention in domestic production matters."

Socal Picks Gulf Coast Refinery Site

A 100,000-bbl. refinery is planned at Pascagoula, Miss., by Standard Oil Co. of California if its merger with Standard Oil Co. (Ky.) is approved early next month.

Officials of the two companies announced last week the Mississippi coastal town has been selected as the refinery site. Some enabling legislation is required to clear the way for construction. A special session of the Mississippi Legislature was called last week to consider the refinery proposal.

Construction apparently will begin shortly after the September 7 meetings of stockholders of the two firms to vote on the merger. The announcement revealing the site said work would "proceed immediately" following stockholder approval. Socal will take over Kyso October 1 if stockholders approve the deal.

Details of the big plant have not been revealed, but planning apparently is well advanced. Among the units planned is a 17,000-bbl. Isocracker, the hydrocracking process developed by California Research Corp. Standard of Cal's research affiliate. Cost of the project is estimated at $125,000,000.

Adding 100,000 bbl. to Standard of Cal's present 685,000 bbl. refining capacity will make the company the nation's second largest refiner. Humble Oil & Refining Co. leads the list with 961,000 bbl. of capacity, and Texaco Inc. is second at present with 739,000 bbl.

A full range of products will be manufactured at the plant and petrochemical facilities are expected to be added later.

The legislature is considering these concessions to Socal:

... **Ad valorem tax** exemption for 10 years instead of the usual 5 years granted new industry in Mississippi.

... **99-year lease** on one 640-acre section of school land involved in the proposed 3,000-acre refinery site.

... **Deepening the harbor** at Bayou Casotte to 40 ft. The state lawmakers will ask Congress to authorize the Corps of Engineers to maintain the harbor to a depth of 40 ft. Jackson County, Mississippi, government has pledged to deepen the harbor if federal funds can't be obtained for the project.

Supply, market . . . Crude for the proposed plant will come from California Oil Co., Standard of Cal's Gulf Coast affiliate.

The company has been an active operator in both offshore and onshore Louisiana. Last year the Gulf Coast operations had a daily crude production of 55,100 bbl. The parent ranks Bay Marchand field off Louisiana as "the foremost domestic discovery in the company's history." All but a fraction of the 9,000-acre field is under lease by California Oil.

Under the consent decree permitting the Socal-Kyso merger, Socal is permitted to get at least 55,000 bbl. of product daily from its own sources (OGJ, June 19, p. 64).

The Pascagoula plant will more than supply this requirement. The company may use the excess capacity to supply six other southeastern states — Arkansas, Louisiana, Tennessee, North and South Carolina, and West Virginia—but the company has not revealed if it plans to market in these states. They are outside the Kyso five-state marketing area.

The decree also stipulates Socal may buy 40% of its product requirement from independent refiners for the next 15 years. However, this 40% requirement covers only that share of the market now supplied by an existing supply contract with Standard Oil Co. (N. J.) and what comes from the new refinery.

If the refinery goes on stream by 1964, this means the independent refiners will get only 8% of the total market the first year of the merger and 16% the second. A full 60-40 split would come in the fifth year after the Jersey contract is terminated, or in the third year if the Jersey contract is ended after 2 years.

In the deals Socal is making with independents for supply, the company reportedly is requiring the independents to process some California Oil crude.

Runs Dip, Gasoline Stocks Climb

REFINERY runs averaged 8,339,000 bbl. daily for the week ended August 18, down 98,000 bbl. daily from the previous week.

Runs were above 8,400,000 bbl. daily for the first 2 weeks of August, the first time that runs had topped 8,000,000 bbl. daily during a summer season.

Compared with the same week last year, last week's runs were up 204,000 bbl. daily. Most of the gain was due to increased runs in Texas, on the East Coast, and in the Great Lakes area.

Gasoline demand was the lowest since the week ended April 18. Estimate for the latest week was 4,160,000 bbl. daily, down 350,000 bbl. daily from the previous week and off 640,000 bbl. daily from the peak week for the year, which came at the end of July. Since such wide variations in summer gasoline demand are not normal, later data may show there was a good gain.

Reduced demand with practically no drop in gasoline production resulted in an unseasonal increase in gasoline stocks. Total gasoline inventories gained 1,523,000 bbl.

A little better than half of the net increase was in the Oklahoma-Kansas and North Central districts. Part of the stock increase for these areas may have been related to the cut in gasoline prices announced August 22. If jobbers were expecting a lower price, they probably held terminal liftings to a minimum during the week ended August 18.

Other important stock increases were in East and West Coast districts and in Texas Gulf Coast. However, part of the Texas Gulf increase was offset by decreases in Louisiana, Arkansas, and Inland Texas.

OCTANES AT 1950 COST

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Schools and Industry Differ:

What's Ahead for Geologists?

THERE isn't going to be any improvement in the job outlook for geologists in the next 5 years.

That's the conclusion of a special committee of the American Association of Petroleum Geologists. The committee is making a study of employment in the profession.

In a report on what's likely to occur during a 5-year period, the committee quotes estimates that:

...Oil and mining companies, government agencies, and colleges will hire about 600 geologists a year between now and 1965. This won't come close to the number of geologists who will be getting degrees. Industry hired only 309 geologists in 1960.

...Colleges expect geology enrollments to increase.

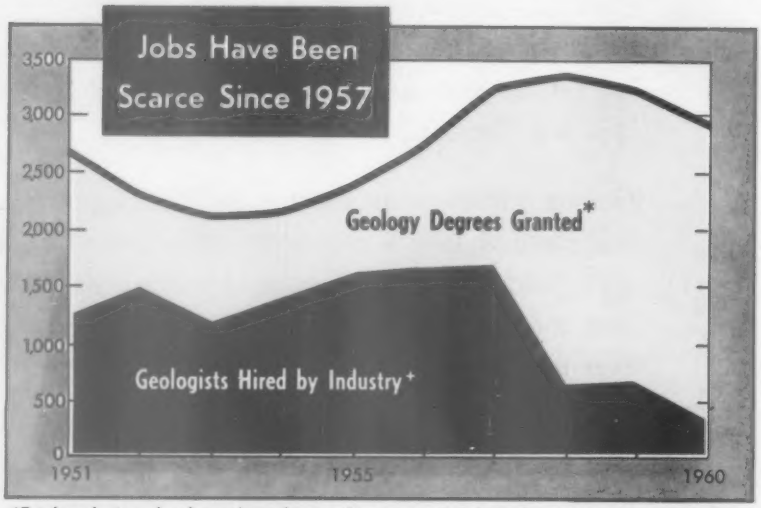
The report points out that opinions differ on the number of geologists expected to be available.

"It is anticipated that industry expects the total population of geologists and geophysicists to continue to decline for the next 5 years," the committee says. "Conversely, the universities . . . have estimated that total enrollment of graduate students will continue to increase over the next 5 years and that total junior and senior geology majors will continue to increase at an even greater rate. Thus, universities are expecting a total enrollment of 9,000 in 1965, which would surpass the maximum achieved in 1958."

The committee doesn't agree with such an enrollment forecast. It notes that the universities probably base their big figure on the fact that the postwar population boom means schools will be flooded in the next few years, and geology departments count on getting their share.

"But," the committee says, "it would seem reasonable that continued depressed hiring on the part of industry will have a more profound effect upon total enrollments in geology than has been anticipated by our universities."

And if industry doesn't take up the slack: "A rapid expansion of future exploration programs will be impossible due to the lack of trained geologists."



*Total graduate and undergraduate degrees †Does not include hiring by government and universities.
Source: American Association of Petroleum Geologists

Other findings . . . The study committee says certain employment conditions are now clear:

...Most industrial opportunities in the next 5 years will go to holders of master's degrees as minimum academic training.

...Major oil companies and many independents are interested only in geologists coming directly from the campus, with little or no experience.

...The mining industry and some of the smaller independents are interested mainly in geologists with 5 or more years of experience.

...Geologists with bachelor's degrees may find their chances for job opportunities limited to subprofessional assignments.

...Rumors of mass firings are not true, the committee indicates. In replies from companies employing 12,000 geologists, there were reports of 964 terminations—only 433 at company request.

Questionnaire surveying by the committee also turned up the fact that starting salaries for geologists are down from the level of 5 years ago.

Nowadays starting salaries range from $437 monthly for the holder of a bachelor's degree, $488 for a master's degree, and $582 for the PhD.

Training faults . . . The committee asked industry to comment on any weaknesses recognized in college training of the new crop of geologists.

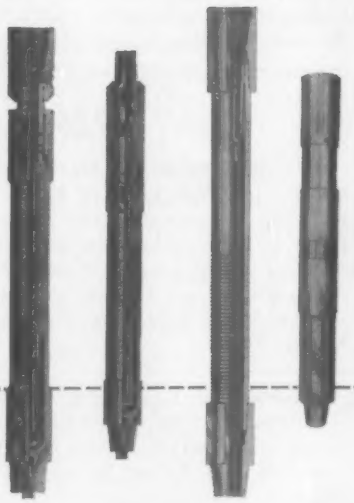
Employers of about 12,000 geologists—roughly half of today's salaried geologists—indicated there are basic "lacks" in educational backgrounds of these professionals.

Many companies see a need for more training in mathematics and physics. Other companies say a good many of their geologists should have had more English courses.

Study continues . . . Orlo E. Childs, chairman of the 24-member committee for industrial-academic relations, says there will be no letup in the AAPG's probe of the job situation and the future training requirements of the profession.

The committee, which got the study under way last year (OGJ, Dec. 5, 1960, p. 80), plans to meet November 2 in San Francisco. It will decide on the form of a new questionnaire which will be mailed out in December. The return deadline for the questionnaire will be February 1, 1962, and a report on 1961 job conditions in the profession will be given at the AAPG meeting in San Francisco next March.

IMAGE OF EXPERIENCE



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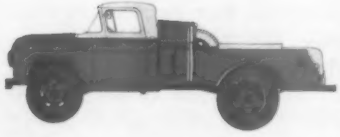

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Tax-Burdened Refinery Fights for Survival

- Humble's opposition to mounting property taxes in Bayonne, N. J., leads to an industry campaign aimed at lowering the cost of local government.

IN the city of Bayonne, N. J.—small by metropolitan standards—management and labor leaders are writing what may be a legend of industrial cooperation in fighting a vital community problem.

Led by the manager of the Humble Oil & Refining Co. plant there, a Labor-Industry Committee recently closed the books on a partially successful fight to get Bayonne's tax rate stabilized. The group immediately announced that a year-round program would be instituted to help put the city—beset by problems of declining industry—back on a sound footing. Cochairman and a vital force in the organization is Fred Westphal, the Humble Bayonne plant manager.

Bayonne's background . . . Located in the New York metropolitan area, Bayonne has a population of 74,000—down from a peak of 90,000 a few years back.

The tax rate has increased 30% in the past 5 years. Bayonne's rate is the eleventh highest of the 567 communities in New Jersey. This comparison is based on the effective rate of taxation per $1,000 of true value of real property.

The tax rate now is $92.71, compared with about $70 in 1955. During this same period, the total value of real property taxes dropped from $148 million to $136 million.

A major portion of the decline occurred when Tidewater Oil Co. abandoned its Bayonne refinery in 1956 and built a 150,000-bbl. plant in Delaware.

Humble's role . . . Humble's Bayonne plant during World War 1 had a capacity of 80,000 bbl. daily and a payroll of 5,500 employes.

In the 1920's, as Standard Oil Co. of New Jersey built other refineries, the Bayonne installation began to decline in importance. By 1945 its capacity was down to 60,000 bbl. daily. As recently as 1957 there were 1,600 workers on the payroll. This has since declined to less than 800 employes.

Instead of being a complete refinery, Bayonne is now a terminal and specialties plant. Principal products are lube oils, waxes, asphalts, and additives. A sideline activity is the provisioning and fueling of all Humble tankers entering New York Harbor. The annual payroll totals about $6 million.

For carrying on these activities, Humble last year paid $3,172,000 in local taxes—more than 25% of the taxes collected in Bayonne.

Beginning in 1957, after receiving assurance from the city fathers that an effort would be made to stabilize the city's operating costs, Humble started replacing old facilities and modernizing its plant at Bayonne. This program is now essentially complete.

Recently a portion of Humble's asphalt operations was transferred from Bayonne to the company's larger Bayway refinery at Linden, N. J.

Formation of committee . . . An important step in the drive for lower taxes took place last November soon after the city commission announced a $10 increase in the tax rate was being considered for 1961.

At a meeting with five commissioners, Westphal outlined the desperate problem facing the plant. He stressed how, under Humble's decentralized organization policy, each refinery had to stand on its own two feet. For this reason, he told the commissioners, plans for further modernization at the Bayonne plant were being suspended until the 1961 city budget had jelled.

This touched off an extensive campaign by other industries and major labor unions represented in Bayonne. Underlying the drive was the realization that if any of the major industries was shut down, its tax burden would have to be assumed by the others. This could result in Bayonne becoming a ghost town, they said.

Informal meetings between labor leaders and plant managers had been going on for some time. Recognizing the industry-crippling potential of the predicted tax hike, the group organized formally into the Labor-Industry Committee.

Representatives of the committee met with each city commissioner for the purpose of studying the budget and possible places for reductions. Net result was a recommendation for a cut of over $500,000 in city expenses in the $14 million budget, about 87% of which comes from taxes. Similar meetings were held with the school board and county officials concerning reduced expenses in their parts of the $14 million. The committee asked that property taxes be reduced $3 a year for 3 years.

During succeeding months the committee, working with other civic groups, sponsored letter-writing campaigns, telephone surveys, and other efforts aimed at lower taxes. A highlight was a standing-room-only public hearing on the tax question.

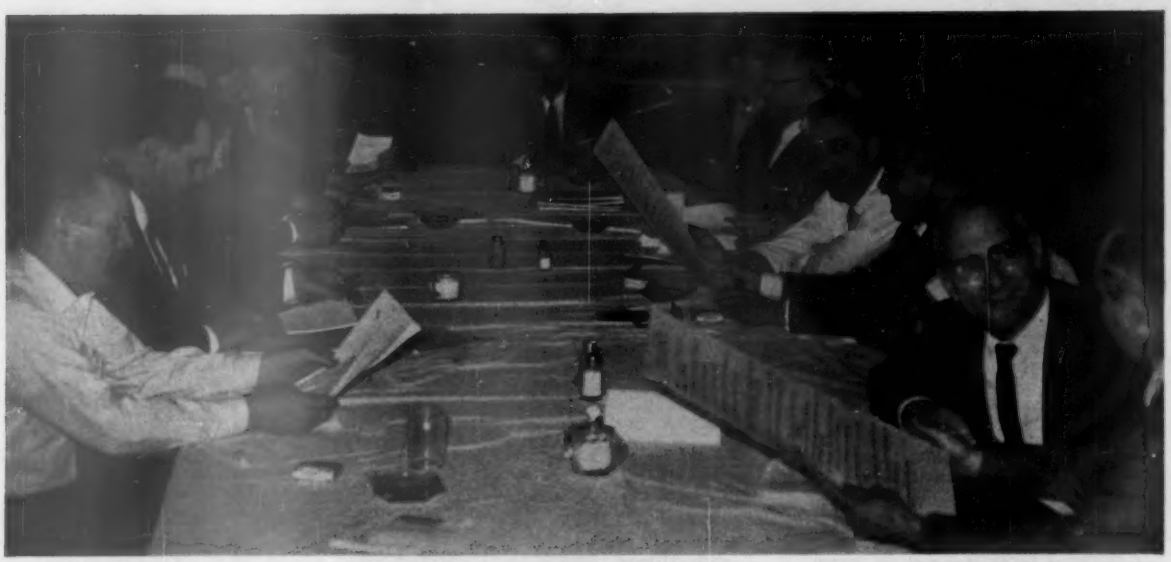
In letters to city commissioners, labor union members repeated time and again that a tax crisis existed in Bayonne and that "something must

PIPELINE

FPC has authorized Transcontinental Gas Pipe Line to build a 4,200-hp. compressor station and 17 miles of pipeline connecting offshore - Louisiana gas reserves with Transco's system. Transco plans to buy gas in the field from Gulf and Socony Mobil.

Natural Gas Pipeline Co. of America has temporary FPC approval to expand capacity by 60 million cubic feet. Project includes 257 miles of 30-in. loops paralleling existing 26 and 30-in. pipelines along the Texas Gulf Coast to Chicago system.

Contracts have been awarded for construction of four pumping stations and two delivery terminals for West Shore Pipe Line Co., which is laying a 285 - mile products line



ALARMED that Humble might close its refinery, unions and managers of other Bayonne industries helped organize the Labor-Industry Committee, which is pressing for a tax cut. At the head of the table is Fred Westphal, committee cochairman and manager of Humble's Bayonne refinery.

be done to keep our industry in Bayonne, give people work, and save the value of our homes."

Limited success . . . The city commission last March voted to increase the tax rate by $3. This was later scaled down to $2.41.

Although the committee failed to achieve a tax reduction, its efforts are credited with minimizing the amount of an increase. And the battle is far from over.

Humble this month filed an appeal with the Hudson County Tax Board in which the company protested its $3,250,000 tax bill for this year. Humble termed the tax "discriminatory."

And the LIC has stepped up a campaign to change Bayonne's form of government to the mayor-city council type.

Whether the tax-cut effort succeeds or fails, Westphal said, "The goal of the LIC is efficient government. That has been and will continue to be its main goal.

"We will continue to support essential municipal services. We will continue to back high standards in our schools. We will continue our efforts to help the city achieve the right number of people on its rolls at the right pay. We will continue to take a positive, constructive approach with specific recommendations on economies without hurting essential services."

BRIEFS . . .

from Chicago to Milwaukee and Green Bay, Wis. Midwestern Contractors, Inc., was successful bidder on Des Plaines terminal in Illinois and the pump stations. Poling & Bacon Construction Co., Inc., will build Jones Island terminal in Milwaukee County.

Houston Pipe Line's proposed sale of 70 million cubic feet daily of natural gas to El Paso Natural Gas has been cleared by an FPC examiner who ruled it would be an intrastate sale and not subject to FPC regulations. Gas involved would be produced, transported, and consumed in Texas.

Construction of 82.5-mile 20-in. gas pipeline from Menominee, Ill., to Janesville, Wis., has been awarded to R. H. Fulton Co. by Northern Natural Gas. Subsidiary construction includes 180 miles of 26-in. and 30-in. loops. Biggest sections are 60 miles of 26-in. east of Ogden, Iowa, and 63.6 miles of 26-in. east of Waterloo. Fulton began work from Ogden late in July.

Proposed sale of natural gas by Lo-Vaca Gathering Co., Corpus Christi, to El Paso Natural Gas would be subject to FPC jurisdiction, an FPC examiner has ruled. Lo-Vaca plans to sell 50 million cubic feet daily to El Paso, which would use all of it as fuel in compressors, treating plants, boiler, and other facilities located outside Texas. Lo-Vaca contends FPC has no jurisdiction because the gas would be for El Paso's own use.

Increase of 3,400 hp. has been approved by FPC at El Paso Natural Gas Co.'s compressor station in Eunice field, Lea County, New Mexico. El Paso also will build 8.8 miles of 12¾-in. field line in Lea County to take residue gas from Skelly's plant.

Also for Pipeliners . . .

IN THE NEWS: Nation's longest nitrogen pipeline is being laid in growing petrochemical area of Delaware Valley (p. 57) . . . A group of security analysts says oil securities aren't as attractive from a growth standpoint as they were 2 years ago (p. 43) . . . Russia may soon have a surplus of natural gas and start to pipeline it to western Europe (p. 58).

PLUS THIS TECHNICAL REPORT: Water layer in a pipeline speeds flow of heavy crude (p. 68).

New Bill Would Ban Below-Cost Sales

THE House Interstate Commerce Committee held hearings last week on bills that, if passed, would put new wrinkles in the brows of those involved in oil marketing.

One of the bills would prohibit "below-cost" sales. The other would give the Federal Trade Commission power to issue a temporary cease and desist order while an FTC complaint is pending against a company for possible violation of an anti-trust law.

The legislation is not specifically aimed at oil, but oil would fall within its jurisdiction.

Rep. Wright Patman (D.-Tex.) said the "below-cost" bill was aimed primarily at large chain store operators who cut prices in one locality, to force out the local merchant, while charging higher prices elsewhere.

Under the proposed bill, a company in interstate commerce could not sell a product—such as gasoline—at "unreasonably low prices" if he was charging a higher price anywhere else.

Patman's definition of an unreasonably low price is one that is less than the cost of manufacturing, packaging, transporting and selling a given product. Where the retailer does not manufacture the product, a below-cost sale would be one less than his invoice price, plus overhead and other costs.

Patman said the bill was needed to prevent small business firms from being put out of business and to prevent the growth of "monopolistic giants."

And he said the bill to give FTC authority to issue temporary cease and desist orders was necessary because otherwise a company is able to keep right on doing what it is being charged with until the case is eventually settled. The settlement, Patman said, often comes after the injured party has already been forced out of business.

Several members of the committee raised questions about the application of the proposed law to ban below-cost sales.

One wanted to know if the proposal meant that a refinery in, say, Oklahoma couldn't cut his prices to a Texas outlet to meet the price of a competing Texas firm which would not be subject to the law because it refined and sold its products inside the state.

Another pointed out that a major supplier might be unable to reduce his price to an outlet even though that customer was being forced out of business through price-cutting by a local competitor.

Patman insisted repeatedly that the merchant would still have ample protection against unwise FTC action because he would be permitted to attend a "show cause" hearing to object to a proposed cease and desist order and he would later have ample opportunity to defend himself in normal court procedures.

The hearings have not yet been concluded. It appeared likely, from the attitude of several committee members, that the proposed legislation will have tough sledding.

Gasoline Price Wars Raging

. . . in areas where Gulf and Sun test their sub-regular gasolines. Marketing group asks federal investigation.

PRICE wars continued last week in the test areas where two pricing innovations aimed at meeting private-brand competition are being tried.

And the bitter competition brought a call for help from Washington by independent marketers and jobbers in Indianapolis, one of the markets entered by Gulf Oil Corp.'s new sub-regular Gulftane.

The Independent Oil Marketers Association of Indiana voted to send a delegation to Washington to get aid to "prevent the independent gasoline marketer from being squeezed out of business."

The association, including some independent marketers but essentially a group of jobbers, said it planned to seek an investigation of the price war by the Federal Trade Commission, the Department of Justice, and the Small Business Committees of the House and the Senate.

The delegation was directed by the association board to discuss the "legal aspects of the recently instituted pricing policy of Gulf Oil Corp. which touched off the current price war and drove retail prices in the Indiana area to as low as 21.9 cents a gallon."

Indianapolis war . . . Before the organization acted, prices had already started to move upward in Indianapolis.

Gulftane, a lower-octane regular priced evenly with private brands, was introduced in Indianapolis, Buffalo, and the Norfolk-Newport News area early in August after a trial in San Antonio. The result was the same, with some variations.

In Indianapolis, retail prices dropped generally to 22.9 for Gulftane and the regular gasoline of majors and private branches. On August 21 Gulftane moved up to 25.9, pulling private brands to this level. Most majors moved up to 26.9, but Standard of Indiana and Mobil stuck with Gulftane. The normal retail is 32.9 for majors, with private brands generally 2 cents lower.

Other test markets . . . The bottom dropped out of the market in Buffalo, where net dealer prices were down to 6.1 cents, or 9.6 cents below normal, and changes were occurring sometimes twice daily.

Retail prices were generally 20.9, with some majors and all private brands meeting Gulftane on the nose, and some a penny higher.

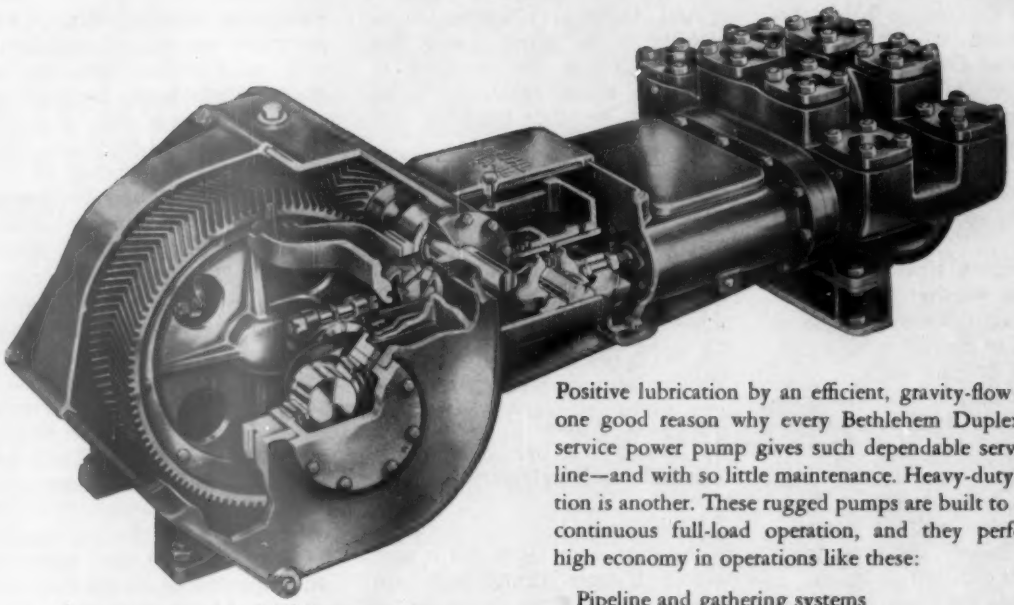
In Norfolk-Newport News, where Gulftane was joined by Sun's nine-grade blending pump last week in dispensing a bottom grade competing with private brands, wholesale prices were off 3½ cents.

Private brands, Gulf and Sun were generally at 26.9, Esso and Mobil were at 27.9, and other majors were at 28.9.

The up and down Charlotte market, most recently more than 5 cents below normal, had the following lineup at the beginning of the week—private brands 23.9, and majors 24.9 to 26.9.

The Bethlehem Duplex

KEEPS OIL ON THE MOVE



Cut-away drawing of the U-510 Duplex shows how lubricating oil, continuously collected from the gear rim, flows through the main and pinion bearings and into the oil chest, from where it is directed to the crossheads and to the crosshead-pin and connecting-rod bearings.

Positive lubrication by an efficient, gravity-flow system is one good reason why every Bethlehem Duplex general-service power pump gives such dependable service in the line—and with so little maintenance. Heavy-duty construction is another. These rugged pumps are built to run under continuous full-load operation, and they perform with high economy in operations like these:

Pipeline and gathering systems
Secondary recovery—disposal and supply systems
Product, LPG, and oil-processing service
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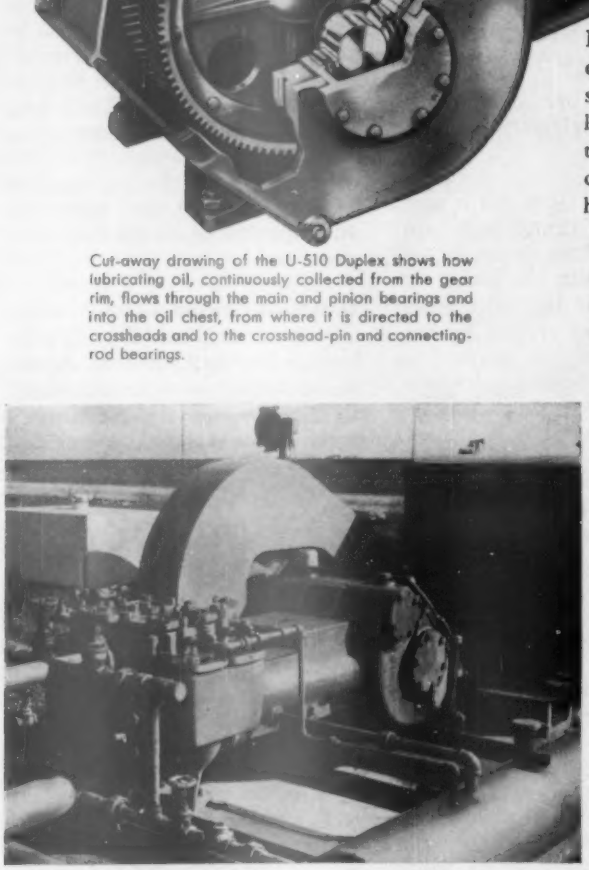

On the job in a crude oil gathering system in West Texas, this Bethlehem UA-46 pump is good for many more barrels to come.

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There's a size for every job. Choose between the U-33, UA-46, and U-510

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Pressures: 340 to 1,698 psi

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BETHLEHEM STEEL SUPPLY DIVISION

Texas Commission May Become More Flexible

- New Railroad Commissioner's views aren't known, but oil men think change in membership will result in policy more sensitive to industry conditions.

HOW the first change in 14 years in membership of the powerful Texas Railroad Commission will affect commission policy was a matter of heavy speculation over the oil patch last week.

No one knows how Ben Ramsey, the new commissioner, will feel concerning wider spacing or small-tract drilling.

No one knows what his opinion will be as to whether the commission should restrict secondary water floods so as to provide more allowable for new primary wells.

These are only two of many important questions and issues now before the commission. And the stance the resigning Texas lieutenant governor takes on any one of them could determine whether commission policy follows the same track or shifts in a different direction.

Ramsey has not made, and is not apt to make, any statement about his feelings on any matter now before the commission.

More flexible commission? . . . But a Journal sounding of industry thinking on the subject finds a general feeling that the change in the membership may result in more flexible commission policies. That is, policies that would be more sensitive to changed industry conditions and more adjustable.

To understand this feeling requires a comparative look at Ramsey and his predecessor, the late Olin Culberson.

During his tenure, Culberson was usually aligned in his position with the most militant independents as a sort of champion of the status quo. Among other things, he fought fruitlessly against permitting dual completions and later against the more-complicated multiples.

He strongly resisted any trend to wider spacing as a threat to the rights of the small operator—once going so far as to file a vigorous dissent to a commission order permitting 160-acre spacing in an oil field where the operators and royalty owners unanimously favored this pattern.

And Culberson's opposition is credited as the prime reason that the commission has declined to adopt the model regulatory forms developed by the Interstate Oil Compact Commission.

As one operator puts it, it sometimes seemed that "the judge" opposed "simply for the sake of opposing."

This isn't to say that Ramsey won't use the veto on occasion. He almost certainly will. But the feeling is he won't use it so consistently.

What kind of man? . . . Ben Ramsey, now 57, is one of the most remarkable political figures in Texas history.

He has been lieutenant governor of the state since 1950 and is now serving an unprecedented sixth term in that office. Three terms is the most any other man has lasted.

His longevity in the office is all the more amazing in that he has seldom made a political speech. His campaigns are habitually slow-starting and of the low-pressure variety.

Prior to his service as lieutenant governor, Ramsey served first under Gov. Beauford Jester then under Allan Shivers as secretary of state. Still earlier, he was a member of the Texas House of Representatives for 4 years and of the Texas Senate for 8 years from his home district in East Texas. His home still is in San Augustine.

In 1955-56, he also served as Democratic national committeeman from Texas.

Conservative tone . . . The new commissioner's political philosophy is staunchly conservative. Though generally highly regarded by most groups, he earned the enmity of organized labor in the state via his successful push for legislation restricting union activities.

He steadfastly refuses to make quick decisions. He examines all issues slowly and cautiously before deciding one way or the other. "He doesn't," a Texas operator comments, "stampede easy."

Favored by many . . . Ramsey's appointment was a highly popular one with most major operators and many independents. He was their pick of the many who sought the post.

There is a large group of other independents, however, who would have preferred someone with a philosophy more akin to that of Judge Culberson.

The new commissioner won't be a "babe in the woods" in oil matters. He has played a key role in legislative battles over many oil issues, usually opposing any extremist legislation. These include such issues as tax fights, ratable take bills, and moves to set minimum allowables.

In the process, he has come to know many oil men well—and where they stand on the various issues.

To take office next month . . . Ramsey, in a brief interview with the Journal last week, said he expects to be sworn in as commissioner about the middle of September.

He will be occupied between now

PROCESSING

A 16,000-bbl. daily increase in capacity of Imperial Oil's 94,000-bbl. refinery in Sarnia, Ont., will be started in October. The expansion of distillation facilities, to cost about $3 million, is to be completed next spring. Contract has been awarded to Canadian Bechtel. Imperial says more refinery capacity will be needed in Ontario by 1963 to meet national oil policy targets for use of Canadian crude and this project will help to meet requirements.

Powerine Oil Co. has placed the first UOP Lomax unit to go on stream in operation at its Santa Fe Springs, Calif., refinery. The new unit is designed to produce about 115-volume-per cent of gasoline from refinery distillate. Normal charge capacity is 2,200 bbl. daily,

and then with making various appointments in the Texas Senate before relinquishing his job as lieutenant governor.

As yet he has made no statement on his appointment. And he will make none, he said, before the swearing-in ceremony.

SunOlin Lays Nation's Longest Nitrogen Line Across Delaware River

THE rapidly expanding petrochemical complex along the Delaware River in New Jersey, Pennsylvania, and Delaware will soon boast the nation's longest nitrogen-pipeline system.

More than 100 tons of nitrogen daily will be piped from Air Reduction Sales Co.'s air-separation plant at Claymont, Del., through a 22-mile line to chemical plants in New Jersey.

After crossing the Delaware River, one leg of the line will run northward to Shell Chemical Co.'s polypropylene plant at Woodbury. Another 10-mile leg will run south to Du Pont's petroleum chemicals plant at Deepwater Point.

The 8-in. nitrogen line is one of 10 being laid by SunOlin Chemical Co. across the Delaware.

Full Wilmington Flood Near

• Operators in California field are expected to approve unit agreement for Block IV in heart of subsidence area.

A MOVE that should kick off full-scale flooding in subsiding Wilmington field is expected to be made next month.

A management committee which represents the many operators in the field is scheduled to approve a unit agreement for fault Block IV September 1. A preliminary agreement was approved several weeks ago.

Developing a unit plan for Block IV has delayed full-scale flooding in the California field, but the recent agreements should pave the way for stepping up the injection to the ultimate of about 1 million barrels daily.

Currently, the operators are injecting about 425,000 bbl. daily into the field. Subsidence has been cut to a rate of less than 0.5 ft. per year compared with the 1951 high of 2.4 ft.

Why important . . . Block IV is considered a key to developing the full-scale flood in Wilmington.

The block ultimately will take 305,000 bbl. daily of water, which is the largest injection rate. It also covers a portion of the heart of the subsidence area.

Blocks II and III already are unitized, and injection is at a full scale in Block VI under a voluntary arrangement. When Block IV is wrapped up, this will leave only Block V to be unitized. No major problems are expected here since Long Beach owns about 90% of the block.

A unit plan also may be developed for Block I, but this is in the fringe of the subsidence area and not considered a critical spot. Blocks II and III, which cover most of the Long Beach naval shipyards, and Block IV, just east of the shipyards, are considered the critical areas.

Oil production in Wilmington is expected to increase as the injection and repressuring program is stepped up. Currently the field is making about 76,000 bbl. daily. The city estimates 13,500 bbl. daily of the production is secondary oil resulting from the present flooding.

There's lots of oil in the undeveloped east portion of the field that likely won't be produced until the subsidence problem is licked.

BRIEFS . . .

however, throughput can probably be increased to 3,000 bbl. daily. Hydrogen required in the fixed-bed process will be supplied by existing Platforming capacity plus a new UOP Platformer.

A gasoline-recovery plant will be installed at Carpinteria, Calif., by Standard Oil Co. of Calif., Western Operations, Inc., and Humble Oil & Refining Co. to process 20,000 M.c.f.d. of gas from offshore oil producing properties. Southwestern Engineering Co. has the contract for constructing the $500,000 unit with completion expected in January 1962.

A multi-million dollar construction program will get under way late this year at Gulf's Cincinnati refinery. The rebuilding project will include installation of an atmospheric and vacuum crude-distillation unit, an alkylation unit, a Gulfiner, a CO boiler, and the complete renovation of several existing facilities. The refinery's present crude runs average about 28,000 bbl. daily. After modernization, crude runs are expected to be 32,000 bbl. daily.

A combination 2,700-bbl. Unifining and Platforming unit and a 5,000-bbl. middle-distillate Unifining unit have gone on stream at Consumers Co-Op's Regina, Sask., refinery. The units were designed and licensed by UOP.

A new polypropylene plant recently completed by AviSun will officially go on stream next month. The 100-million-pound-per-year plant will make AviSun the world's largest polypropylene producer.

An amine-treating plant is planned for the Black Butte-Aden area of southeastern Alberta by Canadian-Montana Gas Co., Ltd. The unit, which will remove H_2S from 10,000 M.c.f.d. of sour gas from the basal Ellis and Rundle formations, has approval of Alberta Oil and Gas Conservation Board. The plant will cost $279,620 and be designed by Black, Sivalls & Bryson.

Acetic acid is now being produced in Union Carbide's new Brownsville, Tex., plant. Scheduled for production are acetic anhydride and methylethyl ketone. This plant was originally built by Carthage Hydrocol in 1950 to produce gasoline from natural gas (OGJ, Sept. 23, 1957, p. 84).

Will Europe Come to Depend on Russian

- Russia will absorb its growing gas production for a while. But within 5 years there'll be a big surplus for export. And it might well be dumped in Europe if the supply pattern there isn't already firmly established.

THE ENERGY balance of western Europe could be profoundly influenced by the introduction of soviet oil and natural gas in the next decade.

This potential impact can be greatly softened, however, by full realization of the importance of soviet gas and oil and by taking immediate measures to develop other fuel sources, especially gas, for western Europe while there is still a chance to do so.

This observation is particularly true respecting natural gas. It is here that the risk of soviet economic domination is the greatest, but it is here that the soviets have set up the most ambitious targets. Accordingly, it is here we have the most time.

Clearly, the energy use pattern of western Europe has changed since World War II. For generations, Europe has depended on solid fuels for its basic fuel source as well as for raw materials for its chemical industries.

Since the war, however, coal has decreased in importance as the prolific production from the Middle East oil fields was introduced into European markets. As a result, western Europe today is more nearly a petroleum based economy than even before.

The Soviet Union has experienced another fuels use revolution. As the Stalinist policy of emphasizing coal gradually gave way to the post-Stalin program to develop petroleum and natural gas, solid fuels have assumed a position of diminishing importance in the soviet economy.

The emergence of a large and growing oil and gas industry behind the iron curtain at a time when western Europe has become increasingly dependent on petroleum itself creates a serious problem in evaluating the future of western Europe's energy economy.

The energy balance of western Europe and, indeed, of the free world might well be determined by the success of the USSR in meeting the ambitious goals set out in the 20-year plan just announced.

New era in energy . . . The European situation has become more complicated in recent years with the possibility of importation of natural gas into Europe from Africa and the discovery of substantial reserves at Lacq in France and at Groningen in the Low Countries.

Both western Europe and the Soviet Union are at the beginning of a new era in energy utilization.

There is still opportunity to mold this energy use pattern so as to preserve the integrity and self-reliance of western Europe without dependence on soviet supplies. In a few years, however, the petroleum and natural-gas industries of the Soviet Union will have been developed to the point that it will no longer be possible to resist the economic and political pressure the USSR can bring.

The only opportunity of avoiding a collision between oil and gas supplies from both sides of the iron curtain is to maintain an energy economy in western Europe based on the realization and full appreciation of such a possibility.

Particularly in the field of natural gas it depends upon the establishment of patterns of consumption and physical connections that will make it difficult, if not impossible, for soviet gas to reach the load centers in western Europe.

The time factor . . . The reason that there is still time within which to develop this supply relationship is that the USSR is proposing to meet its growing fuel needs with oil and gas.

As a result, the USSR anticipates a much slower growth in the development of its coal industry and a much more rapid growth in the petroleum and natural-gas industries.

For example, production of coal increased from 391 to 496 million tons per year between 1955 and 1958. By 1965 it is anticipated that this production will range between 496 and 609 million tons per year according to the 7-Year Plan (1959-1965). Thus the possibility was anticipated that coal production might stabilize at the 1958 level.

Production of petroleum, on the other hand, increased from 70.8 to 113 million tons between 1955 and 1958 and was expected to reach between 230 and 240 million tons by 1965. In other words, petroleum would increase by better than 100% even on the lowest of the estimates.

Natural gas, as has been previously mentioned, was expected to show an even steeper increase, amounting to some 500% between 1958 and 1965 and reaching a production of 150 billion cubic meters in 1965.

The important thing here is that while the energy consumption in the Soviet Union is expected to increase dramatically in the near future, almost all this increase will be met by petroleum and natural gas.

Although the 7-Year Plan has now been junked and replaced by a 20-Year Plan, the details of which are not yet available, the trend that was forecast in the 7-Year Plan is expected to continue.

Thus the Soviet Union will find it necessary to devote more of its productive efforts to meeting the goals it has set out for itself within its own borders. It is straining now to do so. The use of turbo-drills and electric downhole drilling equipment are indicative of the emphasis now being placed on penetration in drilling in an effort to meet the ambitious targets that Gosplan (the super economic agency within the Soviet Union) has established for the oil and gas industry.

The American delegation spon-

Natural Gas?

This is the last of four articles by William R. Connole, former member of the Federal Power Commission. The series was based on the observations of the U. S. delegation of eight gas - industry executives who spent July visiting soviet gas facilities.

sored by the American Gas Association as part of State Department's East - West Industrial Exchange Program spent the month of July observing first-hand the strenuous and largely successful efforts to meet these long-range targets.

Gas for export, too . . . It is apparent that the voracious energy appetite of the Soviet Union can be met by these intensive efforts in spite of the distinct shift in taste from coal to petroleum and natural gas.

But it is also apparent that if the rate of growth that has taken place in recent years continues, the prodigious reserves of the petroliferous southern part of the Soviet Union will be able to satisfy more than the domestic market. They will eventually be ready to meet the needs of the export market as well.

The volume of soviet reserves and the stage of development of production and transmission mean that the USSR will be able eventually to reach western Europe with its lines, in spite of the distance from the gas fields to its Western Frontiers.

M. de Corval, research director of the Societe Commerciale du Methane Saharien, has suggested that "gas from the sands and gas from the steppes" would ultimately meet along a line of price parity running roughly north and south through Central Europe.

The location of this line of equal price is vital to the preservation of an all-West source of supply for natural gas in Europe. If too much time is frittered away before the completion of the Sahara project it is possible that the Soviet Union will have built up its production to the point that will permit it to begin exporting into Europe.

POSITION held by Glavgas, the ministry which runs the Soviet Union's gas industry, is shown here. The "trusts" are the equivalent of our contractors. A Glavgas construction trust, for example, might function as a pipeline contractor; an operation trust would be similar to our gas-transmission company.

Since pricing policy in the USSR is largely an artificial thing, to be manipulated for political reasons as well as in response to normal cost concepts, any vacuum of gas supply in western Europe will be a tempting market. If the supply pattern in western Europe has been established already, however, it will be much more difficult to change it. Thus, the full and rapid development of Sahara gas transmission of the Low Countries reserves and indeed, of Lacq, is an economic and political imperative.

In the United States gas nas already captured most of the coal market for which it can compete at today's prices. Further growth is and will be largely at the expense of oil. In the Soviet Union, there is a large area of the coal market that oil and gas have yet to usurp. Present plans call for oil to take those markets within 5 years.

After that, growth of the soviet oil industry will be at the expense of the world oil market—but not until then. Growth of the gas industry could be at the expense of western Europe's oil and coal industry.

True, there are deficiencies in the soviet natural gas industry. But these are at once explained by the speed at which the industry is growing and minimized by the successes experienced in the rest of the industry.

Competent management . . . The secret of the successful prosecution of the program set out by Glavgas lies in the concentration of authority and planning within the government.

Although its budget is subject to review by Gosplan, the ministry is largely free to develop its projects without regard to competing fuels. Such matters will have been resolved by the time the plan is made public.

Glavgas presents an interesting contrast. It is part of the state, of course, yet it does not look on itself as part of government. The men who are engaged in the agency consider themselves members of "industry" and behave exactly as comparable industry employes or executives would in the U. S.

Their training is excellent. Most have been graduated from one or

more of the institutes or from the university. Many have been trained as "gas workers," employes in pipelining or compressor station work, before becoming engineers. Their level of competence is high, as evidenced by the scholarly papers presented at technical meetings around the world.

Their intense curiosity and thirst for greater information on their industry was remarkable.

A delegation had visited Canada, for example, while the Trans-Canada line was being built. They sought experience and knowledge about long line construction that might be used in their own land.

At the annual meeting of the Association Technique de l'Industrie du Gaz en France at Saint Malo, France, this June, for another example, the USSR sent a delegation of about a dozen men. They were highly intelligent, deadly serious and soaked up everything the French gas industry would teach them. By way of contrast, this writer was the only American at the meeting.

Similarly a large delegation from the USSR attended the meeting of the International Gas Union in Stockholm. Several scholarly scientific papers were presented by their group also.

The ministry that is responsible for this development is organized along the lines shown in the diagram, supplied to this writer by the highly efficient and capable General Counsel of Glavgas, Mr. Biekov, who accompanied the delegation throughout the USSR.

Don't underestimate . . . No one who has seen the soviet economy can underestimate its vigor or mistake its irresistible purpose once its mind is made up.

There is a great deal to learn from the soviets. But there is nothing to fear in a contest between their energy economy and ours. The only danger lies in failing to respect the potential of that nation and in not preserving a free energy economy in Europe.

If western Europe's newly developed oil and gas energy foundation is allowed to become dependent on soviet supplies, we might as well forget the niceties of diplomacy. Europe will have had it.

And, if Europe goes, can the United States be far behind?

▸▸▸ Foreign News

UAR to Supply Larger Share of Its

- **Refinery expansions and plans for increased crude oil output will make a big dent in Egypt's product imports.**

EGYPT is pressing forward on a refinery expansion program aimed at cutting the country's bill for oil imports.

Some progress is already being made. The bill for oil purchases last year was about $9 million lower than in 1959. But the over-all $52 million spent for imports was still more than four times greater than the income from crude sales abroad.

Much of the processing equipment for the expansion is being purchased behind the iron curtain. But the increased capacity and flexibility, combined with growing crude output, may in the long run help wean the country from the Russian bloc. This is because most of the Egyptian pounds laid out for crude and products imports are spent in eastern Europe.

New units . . . Egypt's existing private and government-owned capacity of 93,000 bbl. is roughly equivalent to local consumption. Demand is growing, however, and the pattern of refinery yield fails to match the need of any major product.

To help meet the need for additional capacity, two 20,000-bbl. distillation units have been imported from Czechoslovakia. One is being installed at the 30,000-bbl. government-owned Suez refinery, where a coker, and lubricating-oil facilities also are being erected to help improve the country's over-all product yield.

The other Czech unit is being installed at 6,200-bbl. refinery of Soc. Egyptienne pour le Raffinage el le Commerce du Petrole at Alexandria. The government's economic organization is the biggest stockholder, with 49.4%. Caltex is one of the minority shareholders, with 14%.

Mannesman of Germany is building a 65-mile products-pipeline outlet from the Alexandria plant. When completed, it will deliver a full range of products to terminal points along the Nile delta.

The country's largest refinery, Anglo-Egyptian's 60,000-bbl. plant at Suez is not being expanded at present, but it plays a key role in the Egyptian oil industry.

More than half of the crude processed by Anglo-Egyptian, which recently was 50% nationalized, is refined on behalf of the government's General Petroleum Authority, which pays a refining fee. This crude includes oil produced by COPE on Sinai Peninsula, royalty crude taken in kind since 1958 from Anglo-Egyptian and Mobil, and imported crude.

Marketing pattern . . . Thirty thousand barrels daily of crude was imported into Egypt last year. Two-thirds came from Russia and the rest from Saudi Arabia, through Caltex.

Products also must be imported, however, and both crude and products are sold in foreign markets to fulfill trade agreements and balance out local demand.

Fuel oil is the chief product in Egypt, last year accounting for more than half of the total demand of 95,000 bbl. daily. But it is high kerosine demand—more than 16,000 bbl. daily—which calls the tune in the import-export pattern.

Kerosine sales are high because the product is just now replacing wood, wheat stalks, and corn cobs as fuel, and kerosine lamps are widely used for lighting. To help meet demand, 7,400 bbl. of kerosine was brought in from eastern Europe last year, along with 2,700 bbl. daily of heating oil.

Fuel oil, despite its large share of the market, and gasoline are in surplus. Product exports, especially gasoline, are made to such places as Cuba, East Germany, Sudan, and Cambodia.

New coker . . . The new 29,000-bbl. coker being installed at the government's Suez plant by an Italian company, Cia. Tecnica Itali-

Petroleum Needs

ana Petroli, will go a long way toward straightening out the country's yield pattern.

The plant, to be completed in 1963, will transform 29,000 bbl. daily of fuel oil into 10,000 bbl. daily of kerosine and a similar amount of heating or diesel oil, and make 300,000 tons of coke annually. The end products will be worth $22 million more than the original fuel oil.

The Petroleum Commission believes local markets will be able to completely absorb the coker's kerosine and heating-diesel oil output as soon as the unit goes on stream, and will eliminate the import of these products.

The coker also will form the center of a petrochemical operation organized by the government. One fraction will be used as a base stock for an insecticide, and an emulsifying oil will be used in the manufacture of soap. Plans are being made to use nitrogen in the manufacture of fertilizer, while 28,000 tons of sulfur per year also will be produced.

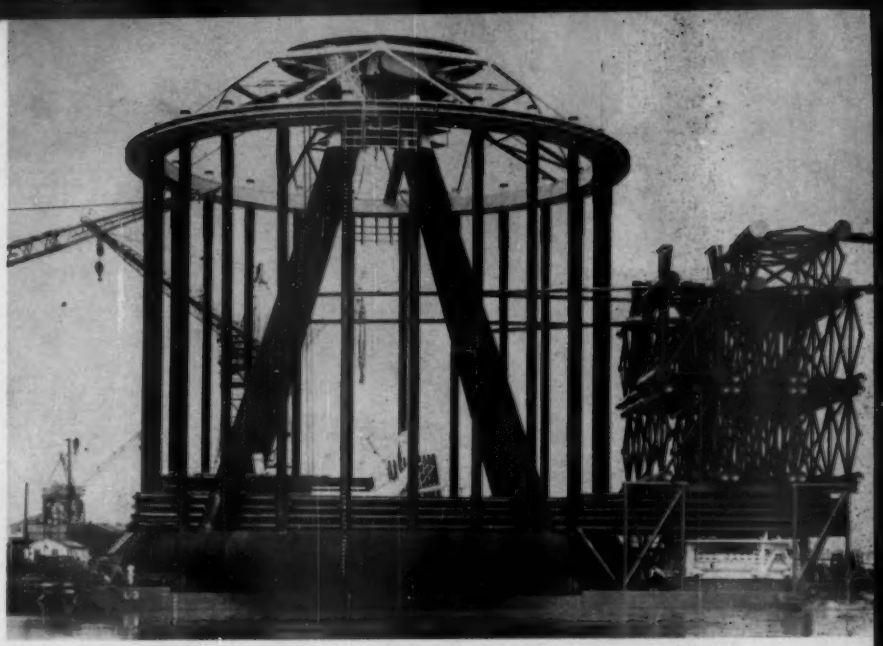
Financial Troubles Beset Two of India's State Oil Companies

INDIA is facing red-ink troubles in two of its newly founded state oil ventures.

Oil India, Ltd., which last year made a deal for Russian products in a move to force down prices in the country, lost about $52,500 in its first year of operation.

Another state firm, Indian Refineries, Ltd., is expected to run in the red for at least its first year of operation. This is because Burmah Oil Co. has been guaranteed a 10.8% net return on the equity capital invested in Nahorkatiya producing area and a 720-mile pipeline system.

The 10.8% will have to be paid even though Nahorkatiya will not be on full production until 1963, when two new refineries are scheduled to be operating.



HUGE MOORING DEVICE will rest on bottom of Mediterranean. Relative size of structure is indicated by man in lower left corner.

Esso Installs New Moorage

. . . at Libyan seaport. Company plans to move 125,000 bbl. daily when facilities are in full operation.

A TANKER mooring and loading structure unique in size and kind is being installed at Esso Libya's shipping terminal at Port Brega, Libya.

The bow-mooring device has arrived in the Libyan port after a 5,900-mile nonstop tow from New Orleans to the sea terminal of Esso's 100-mile 30-in. pipeline from Zelten field.

The 140-ft. high structure will be installed in about 100 ft. of water three-fourths of a mile off Port Brega. When in place, only the top parts of the vertical pipes, the upper ring, and the control house structure will show above water. Tankers will moor with a single line from the bow and a ship will be able to move freely around the mooring, always heading into the wind. Crude oil from storage tanks on shore will flow through a submarine line to the mooring structure, up through pipes in the center, and then into the ship's tanks.

The equipment was fabricated by Avondale Shipyards of New Orleans. Detail design was by Frederick Harris Co., New York, from specifications by Esso Libya engineers.

The unit was towed by a specially built 186-ft. barge with a draft of 13 ft. The voyage from the Gulf of Mexico was rough and stormy. A severe Atlantic storm at one point forced the oceangoing tug and its tow to reverse course for 7 days.

Temporary facilities will be used until the new equipment is in full operation. Esso expects to move 125,000 bbl. daily from the port when its pipeline and terminal facilities are in full operation.

Shell device . . . A smaller single-point mooring device working on the same principle has already been placed in service 3½ miles off Miri, Sarawak, British Borneo, by Sarawak Oilfields.

The Shell installation consists of a 65-ton buoy 27 ft. in diameter, anchored by eight 10-ton anchors. It was designed by Werf Gusto, Holland, in consultation with Shell engineering and marine advisers. Local weather conditions make conventional, multipoint moorings unsuitable.

The device loads both crude and bunkers at the same time through three 12-in. floating lines connecting the buoy with the moored vessel. These are connected to submarine lines from shore.

More Foreign Rigs Active in August

A HIGH level of summer drilling activity continues in foreign areas. A total of 819 rotary rigs are in operation abroad, compared with 814 last month.

These outfits, combined with 1,870 rigs in operation early in August in the U. S. and another 139 active in Canada, bring the free-world total to 2,828.

	AUG. 1961	FEB. 1961	JUNE 1960
LATIN AMERICA			
Argentina	109	109	106
Bolivia	12	11	10
Brazil	40	55	48
British Honduras	1	1	
Colombia	20	12	19
Chile	6	6	4
Costa Rica		1	
Cuba			
Dominican Republic	1	1	1
Ecuador	7	6	3
Guatemala	1		
Mexico	144	134	134
Panama	1		
Peru	13	11	11
Trinidad	23	24	28
Venezuela	29	30	42
Total	407	401	406
MIDDLE EAST			
Bahrain		1	
Iran	17	14	16
Iraq	7	11	11
Israel	4	4	6
Kuwait	3	3	2
Neutral Zone	5	5	6
Qatar	1	1	2
Saudi Arabia	3	3	3
South Arabia	3	3	3
Syria	2	2	2
Turkey	11	11	11
Total	56	58	62
WESTERN EUROPE			
Austria	9	9	9
France	31	30	50
West Germany	88	88	100
Greece		1	
Italy	31	31	31
Netherlands	4	4	4
Spain	7	6	8
Switzerland	1	1	1
U. K.	2	5	4
Total	173	175	207
AFRICA			
Algeria	46	42	53
Angola	3	3	3
Egypt	18	18	11
Senegal	1	2	3
Gabon	2	1	6
Gambia	1	1	1
Ivory Coast	1		
Libya	37	30	32
Mauritania	1		
Middle Congo		1	1
Morocco	1	1	1
Nigeria	3	4	5
Spanish Sahara	1	1	
Somalia	2	2	2
Kenya	1	1	
Tunisia	2	1	1
Total	120	108	119
ASIA-PACIFIC			
Australia	5	5	4
British Borneo	2	2	2
Burma	4	3	3
Formosa	1	1	1
India	17	11	6
Indonesia	12	12	15
Japan	15	15	15
New Zealand	2	2	1
Pakistan	3	3	5
Philippines	1	1	2
Timor	1	1	1
Total	63	56	55
GRAND TOTAL	**819**	**798**	**849**

Note: Estimates are made where up-to-date reports are lacking.

Japan Has Marketing Trouble

- **Import policy, booming service-station construction, high taxes, and oversupply plague gasoline marketers.**

JAPAN'S gasoline market is turning from bad to worse.

This is no surprise in the face of gasoline troubles in the U. S. and Europe. But the Japanese have a set of problems as troublesome as those anywhere. They include:

... **A crude import policy** that in practice is not working out as in theory.

... **A spate** of service station construction that is continuing at a frantic pace despite 1,401 new stations last year that increased total outlets by nearly 20%.

... **Another boost** in gasoline taxes, which now nick Japanese motorists 27.5 cents per gallon, and ultimately hurt the oil industry.

Imports . . . Gasoline sales currently account for about 20% of the local market while fuel oil takes 60%. Under the government's import-control policy, a crude foreign exchange allocation is geared to limit crude imports to meet gasoline demand. That is, the gasoline yield of the crude is to determine the level of imports. Any shortage of fuel oil is to be met with fuel-oil imports.

But with a liberalization of oil imports due to take effect by the fall of 1962, the government's recent exchange allocations have permitted purchase of more foreign crude than is needed to meet gasoline demand.

This has led to an oversupply of gasoline and other white products, which in turn has been followed by declining prices. Like their brethren in the U. S., Japanese oil men seem unable to limit imports or cut back on refinery runs.

Station construction . . . In the face of this adverse situation, each marketer is pouring yen into the construction of new service station outlets, as well as related distribution facilities. They want to have as many outlets as possible when imports are liberalized next year.

In terms of investment, the $22 million spent on the construction of service stations last year equaled 12% of the total investment by the local industry, including spending for refining, marketing, land, and harbor facilities. This year a total of $35 million is being spent for service stations, equal to 11.4% of total industry investment.

There were 1,403 gasoline out-

lets built last year, raising the total in Japan to 8,576. Another 525 were under construction at the end of the year. The stations are handling sales which rose to 95,000 bbl. daily in 1960. The first quarter of this year sales were up to 110,000 bbl. daily.

Regular gasoline of 80 to 85 Research Octane accounts for 90% of the sales. Ninety four to 97 octane premium accounts for 10%. Regular prices, excluding tax, in May ranged from 17.4 cents per gallon in Osaka to 20.6 cents in Central Honshu. Premium ranges from 25.2 to 30.4 cents.

But a 15% additional tax recently was levied which added another 3½ cents per gallon, and raised the total taxes per gallon to 27½ cents. The latest levy was set to finance the construction of national highways.

Other uses . . . The industry is looking hard for other uses for gasoline. Outlets are being sought for the product as petrochemical feed in export sales and as a source for town gas, through cracking of virgin naphtha.

Last year, the petrochemical industry took 11,900 bbl. daily, or 11.3% of total gasoline output. Another 6,300 bbl. daily was exported. As a further means to help control oversupply, some refiners have started importing topped crude from the Persian Gulf.

Libyan Government Is Objecting to Esso's Zelten Crude Posting

THE LIBYAN Petroleum Commission is objecting to the posted price of $2.21 per bbl. on Zelten crude set by Esso International.

Libyan Government officials believe this price tag is too low. They are making no secret of their disappointment and are talking about damage to the rights and interests of the country.

The commission says it intends, by proper legal means, to convince Esso that a more appropriate price should be posted for the 39° to 39.9°-gravity crude.

Esso contends that the posting is in line with Middle East prices (OGJ, August 21, p. 77).

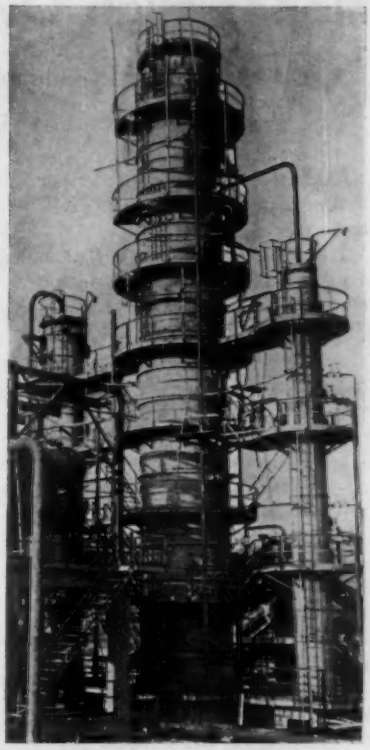
India's Romanian-Built Crude Unit Is Just Waiting on Feed Stock

TRIAL runs will start soon on a new Romanian-built crude distillation unit at Nummati, India.

The first consignment of 3,500 bbl. of Nahorkatiya crude has already been delivered by 25 tank wagons. The oil will be stored at a new tank farm until about 250,000 bbl. is on hand, after which initial trials of the unit will be made.

Trials on kerosine and coke units will start soon after the crude unit is on stream.

The government-owned refinery is scheduled to go on full-scale operation after a 260-mile 16-in. pipeline from Nahorkatiya field is completed. A 460-mile 14-in. extension of the pipeline will be built to Barauni, where the first shipment of Russian equipment for a 40,000 bbl. refinery has been newly delivered.



France, India to Explore Mari Region

FRANCE and India will try their luck in a cooperative exploration venture in the vicinity of a big Stanvac gas strike in West Pakistan.

The Institut Francais du Petrole and India's Oil & Natural Gas Commission will collaborate in a 3-year program in the Jaisalmer region of Rajasthan State.

The French will provide technical assistance and equipment on the same basis as the Russians are doing. The institute will send French technicians to India and train Indian personnel in Paris. An $8-million foreign-exchange requirement, much of which undoubtedly will be used to purchase French-made equipment, will be covered by a credit of $30-million extended by France to the Indian Government.

The remaining $22 million will be used for other purposes. India, however, will ultimately have to bear the entire financial risk of the exploration program.

Denmark's First Refinery to Run Soon

DENMARK'S first refinery, a 20,000-bbl. plant built by Dansk Veedol, was dedicated recently as the prelude to a start up of operations later this year.

As part of the ceremonies, a 46,000-ton tanker, the S.S. Virginia Getty, arrived at the refinery with a load of Neutral Zone crude and other stocks for the plant.

The new plant is located at Kalundborg, which is 60 miles west of Copenhagen.

Processing units include an atmospheric-distillation unit, cat reformer, hydrodesulfurizer, a crude-oil desalter, vacuum-distillation unit, and several treaters. The primary charge will be Neutral Zone and Iranian crude, but some North African and Sumatran crude also is expected to be processed.

A large tank farm with a capacity of 1,590,000 bbl. will handle the imported crude. Tanker facilities include two berths which will handle 46,000-ton class tanker.

Dansk Veedol also is building a chain of service stations in Denmark and Norway.

Hopes High Over UAR's New Offshore Find

- **Discovery well in Gulf of Suez flows more than 6,000 bbl. daily of light crude. Big, new field may open.**

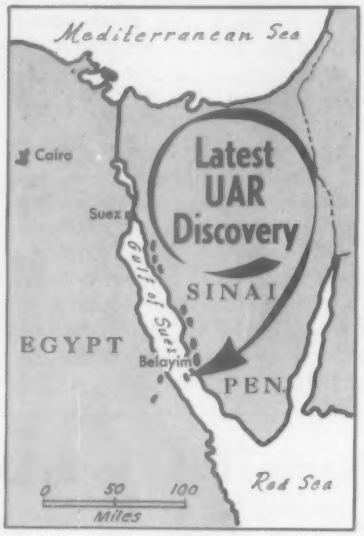
EGYPT is waxing optimistic over its new offshore field in the Gulf of Suez.

The discovery, made earlier this year 5½ miles offshore from Belayim oil field and 90 miles southeast of Suez, tests 800 to 1,000 cu. m., or about 5,000 to 6,290 bbl. daily, of 31.3°-gravity crude. This is the most prolific well and the lightest oil ever found in the country.

The UAR Government on the basis of the initial well thinks it may have offshore reserves of 50 million cubic meters, or 314 million barrels. If this proves to be the case, it will raise Egypt's reserves from the government's estimate of 396 million barrels at present to a total of 710 million barrels.

The offshore well was brought in by Cie. Orientale des Petroles d'Egypte (COPE), a joint government - private shareholder venture. International Egyptian Oil Co., whose major stockholders are Petrofina and an ENI company, Agip Mineria Spa., holds 51% interest. The remaining 49% is held by the government.

COPE rejuvenated the Egyptian producing industry with its discovery of Belayim field in 1955. The field averaged 31,000 bbl. of the 22° to 23°-gravity crude daily last year, and this year is scheduled to produce 39,600 bbl. daily. Belayim, along with smaller Feiran and Abu Rudeis fields operated by COPE, are on a 60-sq. mile concession



along the coast of the Gulf of Suez on the Sinai Peninsula.

A Jersey Standard affiliate once held the concession but walked away from the acreage in 1949 because of what it considered unfavorable new oil laws the Egyptians passed.

The government thinks the new offshore find has opened another 2,700 to 3,100 sq. miles of prospecting areas. This doubles the country's present oil prospecting region—not counting the Western Desert.

The offshore field is also being included in the country's plans for steadily increasing production. Output rose from a modern-day low of 32,700 bbl. daily in 1955 to 62,000 bbl. daily last year. This year output is well on its way to an average of 73,000 bbl. daily.

By 1963, when Belayim offshore production will be available, output is expected to pass the 100,000 bbl. daily mark.

The government's General Petroleum Co. also has started taking small production from three mainland fields found over the past 3 years near Ras Ghareb oil field on the Red Sea coast. These are Bakr, Karim, and Rahmy.

Egypt's next biggest crude producer after COPE is Anglo-Egyptian Oilfields, which has been 50% nationalized by governmental decree. It produces about 20,000 bbl. daily from wholly - owned fields, along with fields owned jointly with Mobil Oil (OGJ, Aug. 7, p. 99).

Mobil handles the balance of the country's production.

Foreign Briefs . . .

A wildcat on Sheykh Shu-eyb Island in the Persian Gulf between Bushire and Bandar Abbas has been abandoned by Iranian Oil Exploration & Producing Co. The well, Lavan 1, was given up after high pressure salt water was struck at 10,466 ft. The rig is being moved to Qeshm Island at the entrance to the Persian Gulf, where Qeshm 4 will be spudded in mid-October.

Opening of Deutsche Shell's new 40,000-bbl.-daily refinery at Ingolstadt, Bavaria, is set for January 1964. The plant will be supplied by an extension of the big-inch line under construction from the Marseille area to Karlsruhe, West Germany. A refinery being built at Strasbourg, France, by Cie. Rhenane de Raffinage, owned 85% by Shell Berre, will supply Shell's South German markets during most of 1963.

Liquefied methane for British gas mains may be moving closer. A Parliamentary Study Committee last week urged the government to approve plans for Conch International (Shell - Continental - Union Stockyards) to move liquefied natural gas by tanker to England for distribution by the Gas Council. Britain's nationalized coal industry opposes the project. Source of the gas will probably be the Sahara. Initial plans call for at least two 28,000-ton specially - built tankers, each with capacity for 11,000 (575,000 M.c.f.) tons of liquefied methane.

Deepest discovery ever made in Germany has been brought in by a joint Mobil Oil-Gewerkschaft Elwerath-Preussag venture 20 miles southeast of Munich. The well, Assling 1, yields 176 bbl. daily of 38°-gravity crude through a choke of about ⅛-in. The 50-ft. pay is a Priabon Tertiary sandstone topped at 11,600 ft.

Honduras has approved assignment of a 10,195-acre (15.9 sq. mile) concession to Pure Oil Co. The rights cover most of the Mosquitia basin in the Department of Gracias a Dios in the northeast part of the country, and include both onshore and offshore areas. Pure is the first large American company to enter Honduras, where only one well, a dry hole, has been drilled.

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Lube capacity edging up slightly

... as new construction replaces obsolete facilities

BY D. H. STORMONT
Refining Editor

FINISHED lube capacity of U. S. refineries is tending to edge upward again after several years of holding steady.

It is not demand which is causing the buildup, however; for like most phases of processing, lube refiners are already blessed with overcapacity.

New construction is sighted toward replacement of obsolete facilities. In many instances, though, capacity is upped slightly in order to care for future needs.

As pointed out by J. A. Coble, of Socony Mobil Oil Co., Inc., at the recent National Petroleum Refiners Association meeting in Cleveland, there is now less excess capacity than in 1958.

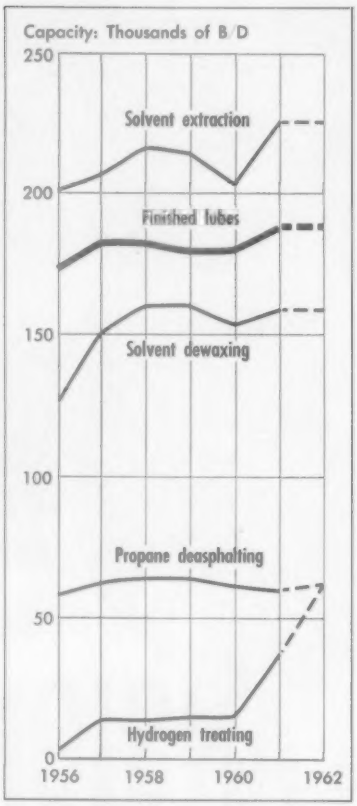
During 1958 production averaged 140,000 bbl. daily, or 43,000 bbl. less than the 183,000-bbl. capacity. Last year's capacity averaged 186,000 bbl. daily, but demand improved to the extent that output was 162,000 bbl. daily.

Process trends. The accompanying table, which is a revised, updated version of the NPRA survey made the first of the year, shows the finished-lube capacity of individual plants.

At mid-year, finished lube capacity totaled slightly over 190,000 bbl. daily. Solvent-extraction capacity totaled almost 224,000 bbl., solvent dewaxing about 160,000, and propane deasphalting 60,200 bbl. daily.

As shown in the accompanying chart, propane deasphalting has remained relatively constant during the past 5 years. Solvent extraction and solvent dewaxing, as well as finished lube capacity, have been edging upward.

Hydrogen treating. After a slow start, hydrogen treating is rapidly being adopted as a lube-finishing process. During 1960 total capacity almost tripled to 36,860 bbl. daily. Units already completed this year assure a first-of-the-year total in excess of 62,400 bbl.



FINISHED LUBE CAPACITY for the United States now stands at just over 190,000 bbl. daily. There's been little change over the past few years in finished or intermediate-processing capacities.

Where adequate reformer hydrogen is available, hydrogen treating offers a relatively low-cost method of improving color, odor, and other properties of the solvent-extracted and dewaxed product. Mild treatment, to desulfurize and otherwise upgrade the lube fractions, is used; thus hydrogen consumption per barrel of feed is quite low.

Because of air-pollution problems and those associated with the disposal of the acid sludges, hydrogen treating is principally being used as a replacement for acid treating.

This is readily reflected in the NPRA annual surveys. The 1955 survey listed the process as being used at 14 plants. That at the first of 1961 showed only nine acid and clay units were in operation. Since then three of these have been shut down.

New hydrotreaters completed already this year include a 13,000 bbl. unit added by Gulf Oil Corp. at its Port Arthur, Tex., refinery.

Sinclair Refining Co. recently completed a 7,600-bbl. unit at Houston. At Baytown, Humble Oil & Refining Co. has added 6,300 bbl. to its hydrogen-treating capacity. On the West Coast, Shell Oil Co. is completing a 5,000-bbl. lube hydrotreater at its Martinez refinery.

Demand outlook. Little additional lube capacity probably will be added at U. S. refineries during the next few years. And in view of the demand outlook, little will be needed.

Last year the export market required about 43,000 bbl. daily, up 10% from 1959. This year it is expected to be up only some 5%, or to an average of 45,000 bbl. daily.

The booming industrial expansion and greater use of autos in Europe and Asia will greatly expand lube-oil consumption, but the outlook is none too bright for U. S. refiners to participate to the extent they have in the past. New lube capacity being added in these areas may result in a lower demand for U. S.-produced lubes.

Insofar as domestic demand for motor oil is concerned, two trends point to a further flattening in the demand curve. These are the growing number of compact cars and the lengthening of the oil-drain period. With auto makers tending to recommend that drain periods can be extended well beyond the 2,000-mile maximum recommended by the oil industry, consumption is not increasing at the pace of a few years back.

Industrial demand for lubricants will probably be off this year, because of the decline in industrial activity.

Lube-oil capacities of U. S. refineries, in barrels per day

PAD District, Company, Location—	Finished lube cap.	Solvent extract.	Solvent dewaxing	Propane deasphalt.	Hydrogen treating	Processes used (see key below)
District 1						
Atlantic Refining Co., Philadelphia	5,000	5,800	3,800	4,000	.....	B, C, H, O, S
Elk Refining Co., Falling Rock, W. Va.	1,180	.....	.....	.....	.....	Q
Gulf Oil Corp., Philadelphia	(1)	2,100	.....	.....	.....	D
Humble Oil & Refining Co., Bayonne, N. J.	225	.....	‡7,200	.....	.....	R
Kendall Refining Co., Bradford, Pa.	1,400	1,100	1,300	1,300	.....	B, G, S
Mobil Oil Co., Paulsboro, N. J.	7,300	12,600	7,000	8,800	.....	A, D, F, S
Pennsylvania Ref. Co., Karns City, Pa.	300	.....	.....	.....	.....	O
Pennzoil Div., Rouseville, Pa.	2,250	1,000	2,250	1,300	.....	E, G, H, S
Quaker State Oil Ref. Corp., Emlenton, Pa.	1,700	1,680	2,000	.....	.....	A, H
Quaker State Oil Ref. Corp., Farmers Valley, Pa.	2,300	1,680	3,000	.....	.....	A, H
Quaker State Oil Ref. Corp., St. Marys, W. Va.	600	680	.....	.....	.....	A
Sonneborn Chem. & Ref. Corp., Franklin, Pa.	700	.....	.....	.....	.....	Q
Sun Oil Co., Marcus Hook, Pa.	11,800	8,000	5,000	.....	.....	A, D, H, N
Valvoline Oil Div., Freedom, Pa.	1,000	.....	.....	.....	.....	Q
Wolf's Head Oil Refining Co., Reno, Pa.	750	.....	.....	.....	.....	Q
District 2						
American Oil Co., Whiting, Ind.	6,300	5,400	9,500	.....	.....	B, F, G
Calumet Refining Co., Burnham, Ill.	750	.....	.....	.....	.....	M
Champlin Oil & Refining Co., Enid, Okla.	1,500	2,850	.....	.....	.....	B, D
Continental Oil Co., Ponca City, Okla.	2,200	4,500	2,850	.....	.....	A, D, H, J
Cooperative Ref. Assoc., Coffeyville, Kans.	1,500	2,200	1,800	.....	.....	A, K, P
DX Sunray Oil Co., Tulsa	7,000	6,000	7,200	4,500	.....	E, G, S
Kerr-McGee Oil Ind. Inc., Cushing, Okla.	1,050	1,500	.....	1,050	.....	B, S
Phillips Petroleum Co., Kansas City, Kans.	2,400	3,000	2,400	2,000	.....	B, G, S
Shell Oil Co., Wood River, Ill.	3,900	5,500	4,700	2,600	.....	B, G, P, S
Sinclair Refining Co., E. Chicago, Ind.	2,750	5,100	5,600	5,650	3,500	B, F, G, S, T
Standard Oil Co. (Ohio), Lima, Ohio	1,800	.....	.....	.....	.....	A, F
Standard Oil Co. (Ohio), Cleveland, Ohio	1,650	.....	.....	.....	.....	Q
District 3						
Bayou State Oil Corp., Hosston, La.	600	.....	.....	.....	.....	N, O
Berry Asphalt Co., Waterloo, Ark.	500	.....	.....	.....	.....	M, O
Calumet Refining Co., Princeton, La.	1,600	.....	.....	.....	.....	M
Cit-Con Oil Corp., Lake Charles, La.	10,000	28,000	12,500	.....	.....	A, D, H
Henry H. Cross Co., Smackover, Ark.	1,280	.....	.....	.....	.....	Q
Gulf Oil Corp., Port Arthur, Texas	†13,000	11,000	6,800	4,000	13,000	A, B, K, L, S, T
Humble Oil & Ref. Co., Baton Rouge, La.	11,000	18,500	16,200	4,500	9,600	B, G, H, S, T
Humble Oil & Ref. Co., Baytown, Tex.	22,200	11,100	13,000	6,800	17,300	B, G, H, S, T
Lion Oil Co., El Dorado, Ark.	1,000	.....	.....	.....	.....	M
Macmillan Petroleum Corp., Norphlet, Ark.	1,500	.....	.....	.....	.....	M
Mobil Oil Co., Beaumont, Tex.	7,000	12,400	9,500	.....	.....	A, D, H
Pure Oil Co., Nederland, Tex.	2,000	.....	.....	.....	.....	B, F
Shell Oil Co., Houston	5,400	8,500	5,900	3,800	6,500	B, F, G, S, T
Sinclair Refining Co., Houston	5,250	5,000	4,000	4,000	7,600	B, F, G, S, T
Texaco Inc., Port Arthur, Tex.	18,000	21,500	13,500	5,000	.....	A, K, S, U
Three Rivers Refinery, Three Rivers, Tex.	750	.....	.....	.....	.....	N, O, P
District 4						
American Oil Co., Casper, Wyo.	760	785	1,835	900	.....	A, F, S
District 5						
Golden Bear Oil Co., Bakersfield, Calif.	1,700	1,600	.....	.....	§1,000	A, O, T
Palomar Refining Co., Bakersfield, Calif.	400	.....	.....	.....	.....	N
Shell Oil Co., Martinez, Calif.	3,100	4,880	.....	.....	5,000	A, T, U
Standard Oil Co. of Calif., Richmond, Calif	10,000	20,000	7,300	.....	.....	B, D, H
Tidewater Oil Co., Avon, Calif.	1,670	1,670	.....	.....	.....	U
Union Oil Co. of Calif., Rodeo, Calif.	2,450	8,200	3,500	.....	.....	D, G, P
TOTAL	190,465	223,825	159,635	60,200	63,500	

*Data shown in table are based on 1961 survey of lube-oil refineries compiled by the National Petroleum Association. †Raffinate from Philadelphia plant is shipped to Port Arthur for processing into finished lubes. Finished lube capacity for Port Arthur includes this movement. ‡Used exclusively in manufacture of wax. §Planned.

Key to Processes Used

A—Furfural
B—Phenol
C—Nitrobenzene
D—Duo-Sol
E—Chlorex
F—Methylethylketone
G—Propane
H—MEK-benzol
I—MEK-hexane
J—Barisol
K—MEK-toluene
L—Sharples dewaxing
M—Special vacuum distillation
N—Vacuum distillation
O—Acid and clay
P—Hot-clay contact
Q—Conventional
R—Crude distillation
S—Propane deasphalting
T—Hydrogen treating
U—Sulfur dioxide

Water layer speeds heavy-crude flow

Pressure gradient can be reduced nine-tenths when 40-60% water is introduced into the pipeline, Alberta Research Council finds

BY M. E. CHARLES
Research Council of Alberta

USING WATER as a bottom layer in a pipeline carrying viscous crude oil can reduce pressure gradients to one-tenth of those encountered in a line carrying such crude alone.

Results obtained in a 1-in. laboratory line were confirmed in a 2½-in. field line. They showed that, with a water content of 40 to 60%, the pressure-gradient reduction is independent of the oil flow rate.

The oil for the present investigation was selected on the basis of a relatively high viscosity and was Lloydminster crude oil—a black oil with a specific gravity of approximately 0.95 (17.5° API) at 75° F. The change of the specific gravity of the oil with temperature is indicated in Fig. 1. The oil contained less than 2% water after treatment for the removal of water and sediment by a standard refinery process.

The rheological properties of the oil were investigated at various shear rates in a Maron-Kreiger variable-head viscometer[5] over a range of temperature from 70° to 160° F. The oil exhibited Newtonian behavior at temperatures greater than 130° F. and shear rates at the wall, $D_w = 8V/d$, greater than 10 sec.$^{-1}$ with the Newtonian viscosity ranging from 1,340 cp. at 70° F. to 62.2 cp. at 160° F.

Non-Newtonian behavior existed for temperatures below 130° F. and shear rates less than 10 sec.$^{-1}$ when the apparent viscosity increased with decreasing shear rate. The rheological properties are summarized in Fig. 2 where the apparent viscosity (obtained from shear stress-shear rate curves by dividing the shear stress by the shear rate at the particular temperature and shear rate) is shown as a function of temperature and shear rate.

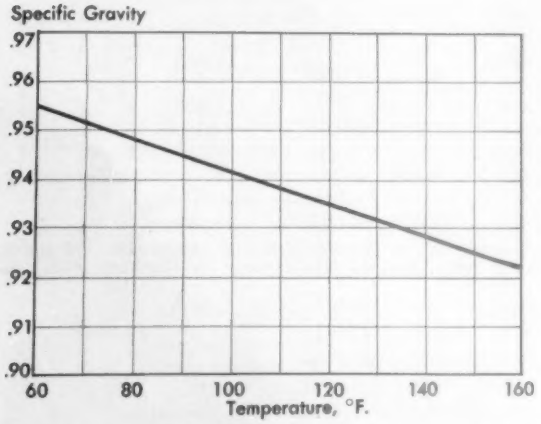
Paper presented at Canadian Institute of Mining and Metallurgy meeting, Calgary.

Laboratory Tests

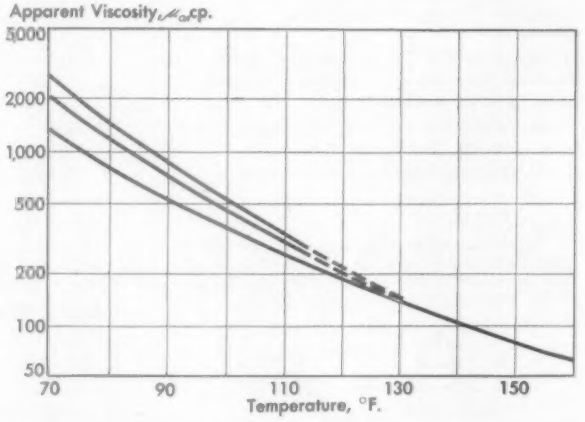
The combined flow of the Lloydminster crude oil and water was initially investigated in a laboratory pipeline. The calming and test sections of the pipeline (which consisted of 1-in. internal diameter, transparent, butyrate pipe) were 10 and 24 ft. long, respectively. The temperatures of the oil and water were measured before they were combined at the beginning of the calming section, and the temperature of the mixture was measured at the end of the test section. Screw-type Moyno pumps moved the oil and water independently to the pipeline; and oil flow rate was metered by means of a calibrated orifice plate, and the water by rotameters.

Experiments were performed in which the pressure drop over the test section was measured on either a water-above-carbon tetrachloride or water-above-mercury manometer for predetermined oil and water flow rates. No attempt was made to recover the oil and the oil-water mixture was pumped to waste. Results were obtained for five oil flow rates ranging from 0.90 to 2.95 Imp. g.p.m. in combination with six water flow rates which give water contents ranging from 9.1 to 62.5%.

Reduction measured. A measure of the pressure-gradient reduction achieved by the addition of water was obtained by comparing the pressure gradient measured in each experiment with the pressure gradient which would have existed had the oil been flowing alone in



EFFECT OF TEMPERATURE on specific gravity of Lloydminster crude. This crude has an API gravity of 17.5° at 75° F. Fig. 1.



RHEOLOGICAL PROPERTIES of Lloydminster crude showing apparent viscosity as a function of temperature and shear rate. Fig. 2.

Earlier studies pointed the way

The transport of heavy, viscous crude oil by pipeline requires relatively high-pressure gradients and therefore large pump stations closely spaced along the pipeline. Usually the high viscosity of such crude oil causes the flow of the oil to be laminar, rather than turbulent, and the pressure gradient necessary to move the oil at a given flow rate may be reduced by adding water to the oil.

The flow pattern which is established on the addition of the water is of paramount importance in determining whether or not a pressure gradient reduction is obtained. The most suitable flow pattern is concentric oil-in-water in which the oil is isolated from the pipe wall by water annulus. The water reduces the pressure gradient by occupying the region of high shear rate next to the pipe wall.

Concentric flow in which both phases are in laminar motion has been analyzed theoretically by Russell and Charles[8] while Chernikin[2] treated the case of laminar oil flow and turbulent water flow. Experimental results for concentric flow have been reported by Clark and Shapiro[4] and Chilton and Handley[3]. A pressure-gradient reduction has also been noted by Charles, Govier, and Hodgson[1] for the flow patterns in which the oil flows as slugs or bubbles in a continuous water phase, as well as for concentric flow.

However, the concentric flow pattern is probably unstable unless the densities of the oil and water are very nearly equal, although when the density of the oil is slightly less than that of the water annulus, concentric flow may be successfully established by imparting a rotational motion to the liquids by means of a rifle on the inside of the pipe, a method originally proposed by Isaacs and Speed[10] and later used in the U.S.A.[6] and Russia[2].

The flow pattern most undesirable from the viewpoint of pressure gradient reduction is a water-in-oil emulsion, which may occur if small amounts of water are added without the establishment of a water annulus, or if both the water and the oil are in turbulent flow. The effective viscosity of a water-in-oil emulsion is usually greater than the viscosity of pure oil[7, 11].

In the general case of combined oil and water flow the densities of the two liquids differ, and stratified flow results with the lighter oil flowing above the water. The stratified flow of two liquids has been analyzed theoretically by Russell and Charles[8] for the flow between parallel plates, and it was shown that a substantial pressure gradient reduction results from the presence of the less viscous liquid.

Russell, Hodgson and Govier[9] investigated the general characteristics of the combined flow of water and a light mineral oil having a specific gravity of 0.834 and a viscosity of 18 centipoise at 77° F. in a 1-in. diameter pipeline. An analysis of their results indicates that pressure gradients necessary to move given oil flows were reduced by a factor of up to about 1.5 when the water was added.

It was the object of the present investigation to measure what reduction could be achieved experimentally for the stratified flow of a heavy crude oil and water in a circular pipe and to determine its magnitude as a function of the oil flow rate and the water content.

the pipe. The pressure gradients for the oil flowing alone were calculated by first evaluating the specific gravity and apparent viscosity of the oil at the required temperature from Figs. 1 and 2.

The lowest average oil velocity investigated was 0.408 ft. per second corresponding to a shear rate of 37.7 sec.$^{-1}$ at the pipe wall and hence Newtonian behavior of the oil was assumed in these experiments. The temperature used to evaluate the oil properties was the temperature measured at the end of the test section. The specific gravity and viscosity values were then used to calculate the Reynolds number, N_{Re}, from which the Fanning friction factor f, was calculated from the laminar flow relationship $f = 16N_{Re}^{-1}$. (The oil was in laminar flow throughout the experiments.) The friction factor gave directly the pressure gradient for the oil flowing alone in the pipe.

This method of evaluating the pressure gradient for the oil flowing alone was faster and more convenient than experimental measurement in the pipeline, and is justified since occasional checks indicated reasonable agreement between the calculated and experimental quantities. The results are reported fully in Table 1. The pressure-gradient reduction factors (the ratios of the pressure gradient for the oil flowing alone to the pressure gradient for the same oil flow rate with water injection) are plotted against the percentage of water introduced for various oil velocities in Fig. 3. It is evident that for water contents up to about 35% the pressure gradient reduction factor was very variable although there was tendency for the reduction factor to be larger for the higher oil flow rates. For water contents between 35 and 60% the reduction factor was less variable and was in excess of 10.

Pipe transparent. Although the pipeline was constructed of transparent material with the object of permitting the observation of the flow patterns, in general, the Lloydminster oil tended to form a film over the inside of the pipe wall which, because of its dark coloration made observation of the flow patterns impossible. However, Russell et al.[8] were able to observe flow patterns for the combined flow of a light mineral oil (with a specific gravity of 0.834 and a viscosity of 18 cp.) and water. In general, they observed that at low water-oil ratios a mixed type of flow existed, which was probably a water-in-oil emulsion.

At higher water-oil ratios the flow became stratified with the oil flowing above the water, while at very high water-oil ratios the oil phase became discontinuous and flowed as slugs and bubbles along the upper surface of the pipe. It is reasonable to expect that the flow patterns encountered in the present study were similar to those observed by Russell et al.; possibly the water-in-oil emulsion would be more likely to form because of the considerably smaller density difference in the present case.

Flow patterns. The highly variable pressure-gradient reduction factors for water contents up to about 35% are probably accounted for by instabilities resulting from a transition in the flow pattern from water-

TABLE 1—RESULTS FOR THE COMBINED FLOW OF OIL AND WATER IN THE LABORATORY

Pipe internal diameter = 1.04 in. Length of pipeline between pressure taps = 24

Oil flow rate (Imp. g.p.m.)	Oil velocity (feet per sec.)	Water content (% of total liquid flow)	Oil temp. (°F.)	Apparent oil viscosity† (cp.)	Calculated pressure gradient for the oil flowing alone (in. water per ft.)	Observed pressure gradient (in. water per ft.)	Pressure gradient reduction factor
0.90	0.408	18.2	83	720	5.00	1.68	2.97
0.90	0.408	25.0	85	670	4.65	1.16	4.03
0.90	0.408	30.8	84	690	4.78	‡0.89-0.96	4.9-5.4
0.90	0.408	40.0	80	830	5.73	0.473	12.1
0.90	0.408	50.0	85	670	4.65	0.421	11.1
0.90	0.408	62.5	84	690	4.79	0.579	8.3
1.20	0.546	14.3	86	640	5.94	‡1.8-2.0	3.0-3.2
1.20	0.546	20.0	85	670	6.26	1.29	4.85
1.20	0.546	25.0	84	690	6.42	1.05	6.1
1.20	0.546	33.0	84	690	6.42	0.526	12.2
1.20	0.546	50.00	85	670	6.26	0.481	14.9
1.20	0.546	62.5	84	690	6.42	0.658	9.76
1.50	0.681	9.1	90	545	6.31	2.36	2.66
1.50	0.681	16.7	80	830	9.62	‡0.66-0.79	12-15
1.50	0.681	25.0	91	520	6.05	0.685	8.85
1.50	0.681	34.8	88	590	6.84	‡0.32-0.39	17-22
1.50	0.681	44.4	87	610	7.0	0.394	17.9
1.50	0.681	62.5	86	640	7.42	0.762	9.72
2.00	0.910	9.1	88	590	9.15	*	*
2.00	0.910	16.7	85	670	10.35	0.631	16.4
2.00	0.910	23.0	86	640	9.94	‡0.32-0.42	24-32
2.00	0.910	33.3	83	720	11.1	‡0.74-0.84	13-15
2.00	0.910	50.0	83	720	11.1	1.0	11.2
2.00	0.910	60.0	82	760	11.8	1.32	8.94
2.95	1.36	9.1	84	690	16.0	*	*
2.95	1.36	16.7	84	690	16.0	1.11	14.4
2.95	1.36	28.6	72	1,200	27.8	‡1.4-1.5	19-20
2.95	1.36	40.0	82	760	17.6	*	*
2.95	1.36	50.0	81	790	18.3	2.95	11.8
2.95	1.36	57.3	81	790	18.3	3.15	11.1

*Unstable readings. †Obtained from Fig. 2. ‡Pressure gradient varied within range given.

in-oil emulsion to stratified flow. The less-variable reduction factors obtained for water contents greater than 35% are probably for stable stratified flow although some variability in the reduction factor was probably caused by the oil which adhered to the pipe wall even in the presence of the continuous water phase.

The promise shown in the laboratory experiments for the proposed method of reducing pipeline pressure gradients was great enough to merit an investigation of the method on a larger scale where the effect of oil adhering to the pipe wall would be less important. Accordingly, a field pipeline was designed and constructed to operate on the same principles as the laboratory line.

Field Investigations

A field experimental pipeline was specially constructed on the site of the Husky Oil & Refining, Ltd., refinery at Lloydminster, Sask. The aboveground, approximately horizontal 170-ft. calming and 565-ft. test sections consisted of lengths of 3-in. o.d. standard pipe with a wall thickness of 0.281 in.

The lengths of pipe were joined with Victaulic couplings supplied by Victaulic Co. of Canada, Ltd., and the pipeline was not insulated. The line continued straight for 68 ft. past the test section and then eventually discharged into a 750-bbl. storage tank. A schematic diagram of the pipeline is given in Fig. 4.

The oil was drawn from the refinery storage tanks by a gear pump, and the water from the refinery spray pond by a centrifugal pump. The oil was metered by a pen recorder which was calibrated by gaging the storage tank, and the water was metered by means of a vane type flowmeter which recorded the cumulative flow.

Gage locations. Pressures within the pipeline were recorded by three dead-weight gages situated at intervals of 268 and 297 ft. on the test section. The elevations of the first and second gages above the third were 2.39 and 0.21 ft., respectively, and allowance for this was subsequently made in the analysis of the results. The gages were capable of measuring pressures from 5 to 1,000 psi. in increments of 0.1 psi. The temperatures of the oil and water were measured immediately before they were combined at the beginning of the calming section. Flow-line temperature measurements were also made at each pressure station, along with readings of the air temperature.

In the operation of the pipeline, predetermined oil and water flow rates were established and pressures and temperatures were recorded simultaneously at each pressure station every 10 minutes. An experiment was terminated when the pressure drop between the first and third pressure stations had not changed by more than 0.1 psi. for three consecutive readings (i.e., over a period of 20 minutes). The flow rates were then altered and readings of pressure and temperature again recorded every 10 minutes.

Pressure points. Pressures were measured at the three stations on the 565-ft. test section for six oil flow rates ranging from 14.7 to 84.2 Imp. g.p.m. in combination with approximately six water flow rates ranging from zero to 50 Imp. g.p.m. The pressure gradient between the second and third stations was generally 5-10% greater than the pressure gradient between the first and second stations because the liquids cooled as they passed through the test section. The pressure gradient over the complete test section was used in the analysis of the results.

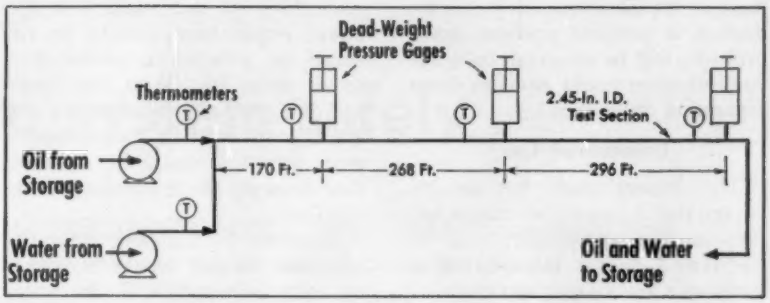
In these experiments the oil was obtained directly from the refinery heated storage tanks and its temperature varied between 125° and 150° F. The water-inlet temperature varied between 65° and 80° F. and the oil was therefore cooled substantially when combined with the water. The calming section of the pipeline thus served a dual purpose; besides providing time for the flow pattern to become stable, the calming section also enabled ap-

proximate temperature equilibrium to be established before the liquids entered the test section.

The temperature measured at the first pressure station agreed well with the equilibrium temperature calculated from the initial oil and water temperatures and flow rates after allowing for a temperature decrease along the calming section. In no experiment did the temperature drop along the test section exceed 12° F. and the average of the temperatures recorded at the pressure stations was taken to be the oil temperature for which the pressure drop over the 565-ft. test section had been recorded.

Oil velocity. The lowest oil velocity used in the field pipeline was 1.20 ft. per second, which corresponds to a wall shear rate of 4.70 sec.$^{-1}$ indicating that as with the laboratory pipeline, the oil flow was within the range of Newtonian behavior. It was thus possible to calculate for each experiment, by a method identical with that used for the laboratory results, the pressure gradient that would have existed had the oil been flowing alone at the same rate and temperature.

This calculated pressure gradient divided by the experimental pressure gradient obtained for the oil flowing in the presence of water gave the reduction factor. The detailed results are given in Table 2 and the pressure-gradient reduction factors are plotted against the percentage of water introduced for various oil flow rates in Fig. 5.

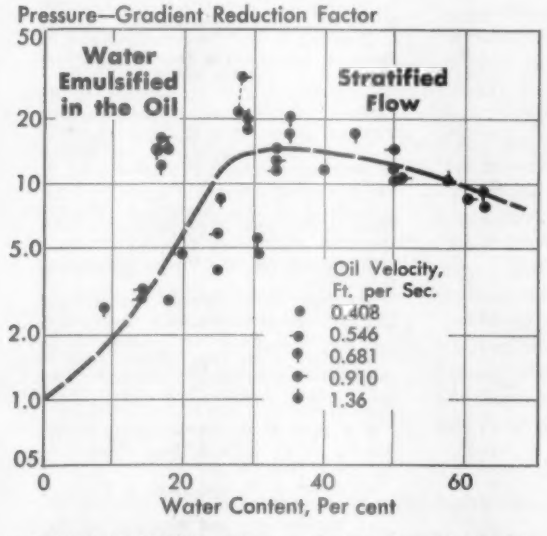


FIELD PIPELINE consisted of 170-ft. calming and 565-ft. test sections of 3-in.-o.d., 0.281-in.-wall-thickness pipe. Fig. 4.

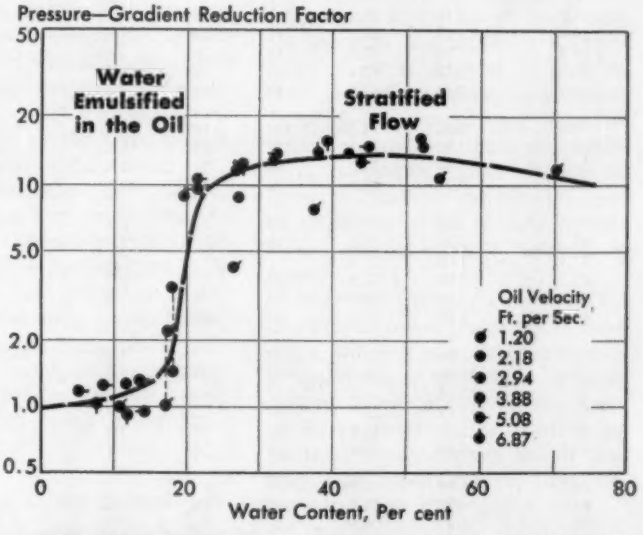
Again, very substantial reductions in pressure gradient are evident. For water contents up to about 20% the pressure gradient was effected very little by the addition of the water and these conditions probably correspond to the water-in-oil emulsion flow pattern. At a water content of approximately 20% a sudden decrease in pressure gradient was observed which is probably coincident with the transition of the flow pattern to stratified flow. For water contents greater than 40% the pressure gradient was reduced by factors in excess of 10. The results obtained with the field pipeline indicate that optimum reduction of pressure gradients is obtained when the water is added to the extent of 30-50% of the total liquid flow.

Reductions alike. The substantial reductions in pressure gradient obtained in the laboratory and field experiments were of a similar magnitude. Although the same oil was used throughout the experiments the viscosity of the oil varied widely (see Tables 1 and 2) because of the considerable variation in temperature. The viscosity of the oil was, however, generally greater in the laboratory experiments. The effect of the oil viscosity is not apparent in the results but it is safe to assume that the greater the oil viscosity, the greater is the possible reduction in pressure gradient.

It is probable that in both the laboratory and field experiments the oil was in laminar motion (since the Reynolds number for the oil flowing alone did not exceed 940) and the water was in turbulent motion. If the oil and water flow rates were sufficient to produce turbu-



PRESSURE GRADIENT reduction factors for 1.04-in.-i.d. pipeline used in laboratory test. Factors vary with water content up to 35%, are relatively stable thereafter. Fig. 3.



PRESSURE GRADIENT reduction factors for 2.45-in.-i.d. pipeline used in field test. Optimum reduction is accomplished with water content of 30-50%. Fig. 5.

lence in the oil, then, although a reduction in pressure gradient would probably still be obtained, oil-water emulsification would probably cause separation difficulties.

Commercial Use

The present study has demonstrated that a very significant reduction in pressure gradient can be obtained by the introduction of water as a lower layer into crude-oil pipelines. For the crude oil used in the tests the pressure gradients were reduced by factors in excess of 10 and this should be applicable to flow in pipes of larger diameter.

It should be noted that the factor by which the power requirement (and therefore the pumping cost) is reduced is not the same factor by which the pressure gradient is reduced because the power requirement is proportional to the quantity of liquid being transported. Thus, for example, if the water constituted 50% of the liquid flow the power requirement would be reduced by a factor in excess of 5 rather than 10. With the lower pressure gradients obtained by the addition of water the economic pipe diameter would be reduced, thus lowering the initial cost of the pipelines.

However, the pumping and initial pipe-cost savings would be offset by costs associated with the water supply and oil-water separation equipment. If the pipeline were long enough to require intermediate pump stations, then provision to separate the oil and water at the intermediate stations would be necessary to prevent emulsification of the water and oil in the pumps.

The present investigation has demonstrated that a considerable reduction in pressure gradient can be achieved by introducing water as a bottom layer into pipelines carrying very viscous crude oils. For water contents between 40 and 60% the pressure gradients in both the laboratory and experimental field lines carrying Lloydminster crude oil were reduced to one-tenth of the pressure gradient for the oil flowing alone at the same rate.

TABLE 2 RESULTS FOR THE COMBINED FLOW OF OIL AND WATER IN THE EXPERIMENTAL FIELD PIPELINE

Pipe i.d. = 2.45 in. Length of pipeline between pressure taps = 565 ft.

Oil flow rate (Imp. g.p.m.)	Oil velocity (feet per sec.)	Water content (% of total liquid flow	Oil temp. (°F.)	Apparent oil viscosity (cp.)	Calculated pressure gradient for the oil flowing alone (lb. per ft.² per ft.)	Observed pressure gradient (lb. per ft.² per ft.)	Pressure gradient reduction factor
14.7	1.20	10.7	124	166	3.16	3.29	0.96
14.7	1.20	17.4	118	200	3.82	†1.8-3.8	1.0-2.1
14.7	1.20	26.4	105	310	5.92	1.43	4.13
14.7	1.20	37.5	96	430	8.21	1.10	7.46
14.7	1.20	54.6	89	570	10.9	1.07	10.2
14.7	1.20	70.6	78	910	17.4	1.53	11.4
26.7	2.18	11.5	119	194	6.73	5.43	1.24
26.7	2.18	18.1	112	245	8.52	†2.6-6.1	1.4-3.4
26.7	2.18	27.0	110	262	9.10	1.07	8.48
26.7	2.18	42.4	93	485	16.8	1.25	13.4
26.7	2.18	52.6	87	615	21.4	1.45	14.8
36.0	2.94	14.05	121	182	8.51	9.10	0.934
36.0	2.94	21.4	102	348	16.20	1.68	9.64
36.0	2.94	32.2	93	485	22.6	1.76	12.8
36.0	2.94	45.0	90	545	25.5	1.79	14.3
47.5	3.88	7.02	134	124	7.7	7.43	1.03
47.5	3.88	11.5	126.5	153	9.49	10.1	0.940
47.5	3.88	17.8	*	*	*	†2.3-12	*
47.5	3.88	27.4	103	334	29.7	1.73	11.95
47.5	3.88	39.4	93	485	30.2	1.98	15.3
47.5	3.88	51.9	84	695	43.2	2.72	15.9
62.3	5.08	5.19	122	176	14.25	12.2	1.17
62.3	5.08	8.59	116	213	17.3	14.1	1.22
62.3	5.08	13.5	113	236	19.1	14.85	1.29
62.3	5.08	21.5	104	322	26.0	2.50	10.4
62.3	5.08	31.9	96	432	35.0	2.73	12.8
62.3	5.08	43.8	90	545	44.1	3.52	12.5
84.2	6.87	10.95	*	*	*	*	*
84.2	6.87	19.7	108	280	30.6	3.52	8.7
84.2	6.87	26.9	102	348	37.8	3.32	11.4
84.2	6.87	38.0	93	485	53.0	3.90	13.6

*Unstable readings. †Variable readings.

Acknowledgments

The author expresses his appreciation to Dr. W. N. McKay, Imperial Oil, Ltd., for detailing the flow characteristics of the oil used in the present investigation, and to the following companies whose support and cooperation made the field investigation possible: Husky Oil & Refining, Ltd., for the provision of site facilities and 5,000 bbl. of crude oil; Imperial Pipe Line Co. for substantial aid; Alberta Phoenix Tube & Pipe, Ltd., for the loan of 1,000 ft. of 3-in. pipe; Victaulic Co. of Canada, Ltd., for the loan of Victaulic couplings; and Canadian Utilities, Lloydminster, for electrical work.

Nomenclature

d = pipe diameter, ft.
D_w = shear rate at pipe wall, $8V/d$, sec.$^{-1}$
f = Fanning friction factor $\Delta P g_c d/2\Delta L \rho V^2$, dimensionless
g_c = dimensional conversion factor, lb.$_M$ ft. per lb.$_F$ sec.^{2}
ΔL = length of pipeline considered, ft.
ΔP = pressure drop over length, $-L$, lb.$_F$ per ft.^{2}
N_{Re} = Reynolds number $\rho Vd/\mu$, dimensionless
V = average liquid velocity, ft. per sec.
μ = liquid viscosity, lb.$_M$ per ft.-sec.
ρ = liquid density, lb.$_M$ per ft.^{3}

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How to operate a flare system safely

THE FIVE MOST FREQUENT CAUSES OF ACCIDENTS involving flare systems which are likely to cause serious damage are:

- **Internal explosions**
- **Liquid carryover from flare stacks**
- **Low-temperature failure**
- **System obstructions**
- **Faulty maintenance procedures**

All of these have one common denominator: the entry of materials that the system is not built to accommodate. These may be air, steam, heavy oil, corrosive materials, low-boiling hydrocarbons, or excess liquid.

Let's review each of these hazards, and see what can be done to minimize them through proper design and operating procedure.

BY W. C. BLUHM
Shell Oil Co., New York

Internal explosions

WHAT HAS BEEN SAID so often about the hazard of the mixture of air and hydrocarbons in an operating unit goes double when applied to a flare system. For here the probability that the source of ignition needed to close the third leg of the well-known fire triangle will be present is not a matter of conjecture. Ignition is guaranteed by the continuous flame at the end of the line.

To minimize the risk, it is common practice either to continuously inject a fuel-gas purge or to install a water seal, flame arrester, or similar device near the end of the line to limit flame propagation. Frequently, a combination approach is used. Although there is much to be said in favor of such precautions, experience has proved that it is wishful thinking to conclude that they will provide ample protection against an internal explosion at all times.

Adapted from a paper presented to API's midyear refining meeting, Houston, 1961.

Continuous purge. The practice of continuously bleeding a small amount of gas into a flare system usually is based on the assumption that, during routine operations, waste-gas flow in the flare system will be negligible. Under these conditions the flame may either pulsate, recede into the line, or go out.

For those fortunate enough to have their flare systems so well under control that purge gas is required to maintain a stable flame, its injection is probably warranted. On the other hand, in the majority of cases normal venting of waste gas into flare systems is sufficient to give a satisfactory flame. Under these conditions, purge gas is unnecessary. If all flow into the flare system stops, the flame will probably go out, but with a reliable pilot system this would not be serious.

Of course, if air were allowed to enter the system, eventually an explosive mixture would reach the pilots and might travel back into the line with destructive force. However, if air is allowed to find its way into a flare system in sufficient quantity that purge gas must be added to avoid a flammable mixture, a serious effort should be made to eliminate the air. The cost of adding purge gas to flare systems would no doubt be a surprise to many.

Although there is little need for continuous use of purge gas in most cases, purging may be necessary at times when air is allowed to enter a flare system during maintenance, or in preparation for starting up facilities which contain air. It also may have application on flare systems handling hydrogen.

"It is common practice either to continuously inject a fuel-gas purge or to install a water seal, flame arrester, or similar device near the end of the line."

Water seals and flame arresters. The reliability of these devices

leaves much more to be desired.

Flame arresters, for example, will protect against flashback only as long as the flame-arresting element can withstand the heat released from combustion. This may be a matter of minutes. Furthermore, flame arresters, gravel boxes, and other devices using small passages to cool gases and thus arrest flame travel are subject to fouling. This may cause excessive pressure drops during periods of high flow and result in dangerous overpressure on connected equipment.

Also, water seals cannot be considered 100% effective for control of combustion inside a flare line. Accidental loss of water levels is not uncommon. Sometimes, in preparation for opening flare lines, seals Even when a water seal functions pressure. In such cases, there is no must be dropped to reduce system as intended and prevents travel of an explosion into the main flare obstruction to passage of flame. system, serious damage may result.

Devices to stop flame propagation should be regarded primarily as a second line of defense. We believe continuous injection of purge gas would be in the same category.

These precautions should never be considered as an acceptable substitute for preventing air from entering the flare system, or, when air is allowed into flare lines, insuring that special precautions are taken to avoid an explosive mixture reaching the flare.

Eliminate air. Air is most likely to find its way into a flare system in one of three ways:

1. Through open vents, drains, or other connections.

2. When it is necessary to open flare lines to work on the system.

3. As a result of venting equipment (e.g., during startup) into a flare system.

Control over these possibilities requires strict procedures. Procedures applicable to flare line vents and drains, for example, should be just as restrictive as those applying to similar connections on process equipment.

All work involving flares should be planned to minimize the time lines will be open, and to keep the size and number of openings to a minimum.

"Devices to stop flame propagation should be regarded primarily as a second line of defense. We believe continuous injection of purge gas would be in the same category."

Frequently, alternate procedures may be adopted which will eliminate the risk of air entry. For example, when purging process equipment during unit startups, it is common practice to vent vessels to the atmosphere (rather than to the flare) until air is displaced.

These are but a few of the typical precautions which reduce the possibility of air in flare lines. Other procedures will become apparent if a comprehensive study is made of the flare system.

Precaution following air entry. In some cases, of course, it is not possible to prevent air from entering flare lines. This is most likely to occur when a section of the system must be gas-freed to permit "hot work" on lines or equipment, in preparation for entering system vessels, or perhaps in connection with work on the flare or its auxiliaries. Two possibilities for internal explosions exist in such cases.

First, when a section of the flare system is restored to service following repairs, air may dilute the hydrocarbon vapors in the balance of the system and form a flammable mixture. The likelihood of such an occurrence depends almost entirely on the rate of waste-gas flow in the flare system. Because it requires about 13 volumes of air to 1 volume of typical refinery waste gases to produce an explosive mixture, a relatively small flow of waste gas will maintain mixtures well on the rich side. However, there may be times during the operation of any flare system (especially while maintenance on the system is in progress) when waste-gas flow is almost negligible. A large quantity of air at such times could be dangerous. To safeguard against this, it is a good practice to release more gas to the flare when connected equipment is restored to service following maintenance. Purging of the section of line, or equipment, that contains air is another approach to the control of this hazard.

The second item to consider is the possibility of a combustible mixture reaching the flare while blinding or gas-freeing lines. This situation will arise when work involves the flare or its auxiliaries. In such cases, all sources of ignition (i.e., flare, pilot lights, and ignition system) should be eliminated before permitting air to enter flare lines.

As an additional precaution, whenever possible, the system should be purged with steam or inert gas before opening connected equipment or lines.

Purging may be of special importance if flare streams include hydrogen sulfide. The possibility of pyrophoric compounds is probably greatest in flare systems where ammonia gases occur in conjunction with H_2S, especially if traces of moisture are present. On the other hand, when acid gases are present, the risk of ignition from iron sulfide deposits is greatly reduced.

Igniting a flare. It might seem unnecessary to point out that, if a flare system was gas-freed while out of service, it should be purged before lighting pilots. However, there have been some serious accidents because of the failure to follow such obvious precautions.

Not many years ago, a large sphere (which had been provided for gas-liquid disengagement in a flare system) was destroyed when the pilots were lighted before the system had been purged. It was being placed in operation for the first time when the accident occurred.

What about purging before ignition if a flare system has been shut down temporarily, but not opened? The question here has to do with whether air will enter the end of the line in sufficient quantities to cause an explosion following ignition. There is evidence to indicate that the explosive mixture will not extend an appreciable distance from the flare tip.

Recently, an experiment was performed in which pilot lights were reignited on a flare system which had remained idle for 60 hours. There was no evidence of combustion receding into the line.

In spite of this evidence we believe it is good practice to purge

before reigniting flares which have been out of service. This would be especially important in the case of flares handling hydrogen.

Vapor recovery. When a compressor takes suction off the flare line for vapor recovery, consideration must be given to the possibility that a malfunction of controls might lower pressure in the flare line to a point where air would be drawn in from the end. Protective devices, such as low-pressure shutoffs, combustible-gas alarms, oxygen recorders, etc., are provided to minimize this risk.

To summarize the hazards of air in flare systems, although water seals and similar devices may prove beneficial, the prevention of explosions is primarily a matter of adherence to the following practices:

1. Avoid operating or maintenance procedures which permit air to enter an operating flare system.
2. When flare systems are to be isolated and gas-freed, eliminate ignition sources at flare tip before admitting air. (If possible, lines should be purged with steam or inert gas before permitting entry of air.)
3. When restoring flare systems to service, purge thoroughly before igniting pilot, especially if hydrogen is present.
4. Protect against flow reversal when recovery facilities are provided.
5. Consider use of a continuous purge in flare systems where average flow is too low to support stable combustion.

Liquid carryover from flares

To prevent liquid carryover from flare stacks, it is common practice to provide liquid knockout drums. When properly designed, these facilities separate large quantities of liquid when accompanied by vapors at high velocity.

From a safety standpoint, design of knockout facilities requires attention to three things: (1) entrainment; (2) pumpout facilities; and (3) sizing of knockout vessels.

Preventing entrainment usually is accomplished by a tangential inlet, internal downcomer on outlet line, or perhaps both. In some cases, cyclone separators have been installed. Use of demister mats should be discouraged because of their susceptibility to f o u l i n g, which could result in a high pressure drop.

The design of pumpout facilities for knockout drums depends upon the size of the vessel and the probability of liquid in the system. In some cases a small pump, manually controlled, or perhaps a drain will suffice. In other situations, it may be desirable to have large pumps automatically operated from level controllers. High-level alarms usually are warranted.

One possibility that is sometimes overlooked in the design of pumpout facilities and which could lead to serious trouble is freezeup in suction lines. This is apt to occur either in cold climates or from refrigeration following entry of low-boiling oils. In one such instance of the latter type, an entire refinery had to be shut down to reduce flare-system pressure and stop carryover of burning liquid from the top of the stack.

The incident was initiated by the release of liquid propane into the flare knockout drum. Evaporation of the propane caused water or other materials to freeze and obstruct the suction line to the pump. An internal steam coil, which apparently contained condensate, also froze. The drum filled with liquid, and, when vapor was subsequently released to the flare following an upset, there was no place for the liquid to go except out the stack.

Sizing of knockout vessels. If the size of the knockout vessel is to be kept within reason, careful consideration should be given to such factors as the type of process equipment connected to the flare, the maximum rates at which liquid can enter the system, and the time operators would require to correct a process upset. When liquid blowdown streams are routed to flares, this may govern size of knockout facilities.

As a result of certain variables involved in sizing knockout facilities, it is not always possible to apply a scientific approach. Thus, sizing often becomes a matter of individual opinion, frequently influenced by past experience. This has resulted in significant differences in sizing criteria within the industry. Flare traps range from small drums up to vessels holding thousands of barrels. Likewise, the size and complexity of pumpout facilities vary g r e a t l y. The large knockout vessels and the high-capacity pumpout systems obviously afford greater protection against liquid carryover. On the other hand, the cost of extra insurance can be appreciable.

Perhaps the most logical way to justify the expense involved in providing elaborate knockout facilities is to examine factors which have been responsible for liquid entering flares in excess of design expectations. Then, determine if it is practical to control the hazard at its source. Traditionally, the most common cause has been the failure of operators to heed indications that a situation was developing w h i c h would result in large quantities of liquid being released into a flare system.

Training the answer. It is important to give operators training so that they can detect trouble quickly and take action. Well-trained personnel, backed up by the alarm devices and safety systems usually provided on modern process units, should be able to correct an upset within 10 to 15 minutes. Good operations seems the logical place for emphasis in preventing liquid carryover, rather than attempting to design knockout and flare pumpout facilities to cope with any emergency, regardless of what the operator does.

Flare-system obstructions

Blockage of a flare system is most likely to occur as the result of either ice or congealed oil.

The possibility of ice plugging a flare system is, of course, more acute in cold climates. In such locations, flare lines should be sloped and free of pockets. In addition, following any procedures where water may enter the system (e.g., washing

"Oil may plug a flare system whenever equipment containing oil, which will congeal at flare-line temperatures, is connected to the flare."

or steaming connected equipment), lines should be checked for water.

Frequently, the source of water in flare lines is steam.

When operating under very severe climatic conditions, steam may even create ice in flare lines that are sloped and free of pockets. This is especially a problem if flare lines are long, and the volume of steam admitted is not sufficient to avoid freezing of condensate throughout entire length of line.

Under such conditions, it may be necessary to insulate and perhaps steam trace the flare line. The preferred practice, however, is to avoid steaming equipment into flare lines when it's very cold.

Another possibility for steam entering a flare system is from leakage of steam coils. These often are provided to vaporize light hydrocarbons which may accumulate in flare traps.

Because of the problem of removing flare systems from service, regular inspection of steam coils may be impractical. Infrequent inspection, in combination with unsuspected corrosion, can lead to leaks. Such leaks are not easy to detect, especially during cold periods. The slow continuous bleeding of steam is ideal for creating an obstruction in the line.

The possibility of ice from steam coil leakage may be minimized by the use of alloy coils. Probably the most foolproof method, however, is to provide an external coil. This solution might be especially applicable in very cold climates or where composition of flare streams is corrosive.

The combination of low-boiling oils and steam coils may result in ice accumulations at temperatures well above freezing. A good example took place recently at a West Coast refinery.

A steam coil had been provided in a 6-ft.-diameter by 10-ft.-long drum to vaporize light products. Corrosion caused failure of the coil and leakage went undetected. When liquid propane entered the drum from a relief valve, the refrigeration effect as the propane vaporized froze the water vapor escaping from the steam coil. The resulting ice formed a plug 5 ft. long in the 12-in.-diameter header.

Another possibility, somewhat related to this example, can occur if water has accumulated in a line and is followed by release of light hydrocarbons. The very low temperatures which result may freeze the water.

Beware of heavy oil. Oil may plug a flare system whenever equipment containing oil, which will congeal at flare-line temperatures, is connected to the flare. As in the case of ice formation, this possibility is more likely to be a problem in cold climates. Under certain conditions, even crude oil has been known to plug flare lines.

A typical example of oil plugging a flare line occurred at one of our refineries. In this instance, the feed surge drum of a vacuum fractionation unit was gas-blanketed. Pressure was controlled by releasing gas to the flare through a pressure controller and 2-in. line. When the drum went hydrostatic, hot residue passed through the control valve and into the flare system. By the time the upset was detected and controlled, the main 12-in. flare line had been completely plugged. This incident occurred in the summertime.

The preferred way to prevent such problems is to eliminate connections between the flare system and equipment which contains hydrocarbons sufficiently viscous to congeal in the flare line. In many types of units such as a propane deasphalter, elimination of flare connections may not be feasible. In such cases disengaging facilities, steam tracing the flare system, or alarms to indicate either high levels or foaming vessels will reduce the risk of heavy oils entering the flare system.

Valves and blinds. To preclude the possibility of a closed valve in a flare system, it is common practice to install chains and padlocks on valves and to keep a record of all changes in lineup on a check sheet. In spite of procedures, however, slipups can occur.

Therefore, as an added precaution, some have found it good practice to provide for routine checks of the system as part of the regular duties of operating personnel.

A final factor to be considered is the possibility of a gate dropping into the closed position because of stem failure or corrosion. To minimize this risk, it is good practice to install valves horizontally.

Atmospheric relief. The possibility of routing the discharge of relief valves in vapor service directly to the atmosphere should not be overlooked. Atmospheric relief is especially desirable in the case of safety valves on equipment, such as a steam-stripping column, where valve leakage would release steam to the flare system. In cold climates, this could lead to ice formation.

In some cases, relief valves venting to the atmosphere may be used in addition to valves routed to the flare, the latter being set to discharge at a lower pressure. Frequently, rather than use auxiliary relief valves connected to a flare, it would be preferable to provide vapor-depressuring facilities. These may be used to dispose of vapor to the flare at the operator's discretion.

Low-temperature failures

There are three conditions usually associated with brittle failure. These are:

- Operating temperatures below the transition temperature of the material from which the line is fabricated. (Transition temperature may be defined as that temperature at which the behavior of a specimen changes from desirable plastic behavior to undesirable brittle behavior.)
- A notch or crack to initiate failure.
- A stress, usually below the stress corresponding to the maximum allowable working pressure.

Eliminate any one of these conditions and the risk of brittle failure becomes negligible.

"The risk of brittle fracture can be significantly reduced in an existing flare system by keeping stress levels low at times of minimum temperatures and by training operators concerning this hazard and means by which it can be avoided."

If transition temperature is to be eliminated as a factor, flare piping systems would have to be constructed of special steels. This would be necessary because the mild steels normally used for such lines may have transition temperatures higher than those which occur following entrance of low-boiling hydrocarbons. Either carbon steels with specified impact valves or nickel alloy steels which would provide satisfactory low-temperature characteristics are suitable.

The effects of a notch, crack, or other source of stress concentration (which may trigger brittle fracture in mild steel pipe below its transition temperature) can be significantly reduced by stress relieving. In certain instances this would be less costly than use of special materials.

A third possibility for reducing risk of brittle failure is to keep stress down during periods of low-temperature operation. Investigations of brittle failure have not resulted in firm recommendations on maximum safe stress levels. However, the information developed to date indicates that if stress can be limited to 6,000 to 8,000 psi. the risk of brittle fracture is significantly reduced. Where this is feasible, it may offer the simplest and least costly solution. Furthermore, stress reduction is probably the only practical approach when there is risk of brittle failure.

Checking for stress. We recently investigated stress levels for low-temperature operation of flare lines. In one instance, at a comparatively new installation, it was found the stress could exceed yield if propane entered the system.

This is being corrected by a new expansion joint and rearrangement of anchors to shift stress levels to coincide with high temperatures.

At another location, calculations indicated the stress in a flare line would be excessive during low-temperature operations. Before corrective measures could be made, liquid propane entered the line and the calculations proved all too accurate, as the line failed in a weld at a mitered joint.

The risk of brittle fracture can be significantly reduced in an existing flare system by keeping stress levels low at times of minimum temperatures and by training operators concerning this hazard and means by which it can be avoided.

Hazards in maintenance

Because personnel may be exposed to dangerous materials, there are few jobs that are planned in such detail as those which require opening an operating flare line.

Probably the most common type of accident involves the asphyxiation of workmen from hydrogen sulfide, or other toxic gases, while opening lines for installation or removal of blinds. Invariably there is some leakage when flare lines are opened, regardless of efforts to depressure the system. In anticipation of this it should be axiomatic that workmen always protect themselves with a suitable gas mask when opening flare lines. This is standard procedure throughout the refining industry.

Training should be keyed to the old axiom of hoping for the best but expecting the worst. This implies thoroughly instructing those involved on what to do in the event that an emergency occurs while work is in progress. All too frequently, when a workman is overcome from fumes, would-be rescuers fail to protect themselves and become victims. A spare gas mask, combined with the presence of someone trained in its use and with a knowledge of first aid, can turn a potential tragedy into a successful rescue.

Careful planning essential. Although the responsibility for accident prevention when work is performed on flare lines rests largely with those doing the work, all jobs involving flare facilities should be closely coordinated with operating departments. Every department with connections into the flare should be notified well in advance concerning details of any work being planned. Additional notification should be given by telephone or messenger immediately prior to the start of work and again after completion. Effective communications between operating units and those at the job site are a must.

With careful planning, no deliberate venting to the flare should occur. Furthermore, if an emergency does arise on a unit and a release to the flare line appears imminent, those working on the system can be promptly notified. Properly forewarned, the line may be closed up. If time does not permit, the area can be cleared of personnel. All these precautions may require a great deal of time and effort, but experience has proven time and again they pay off in the safe completion of such work.

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Processing notes

Canada's latest gas-processing plant boasts many firsts

A MYRIAD of cost-cutting feautres have resulted in a comparatively low cost of $12,500,000 for Canada's newest and largest - capacity gas-processing plant. The 326-M.M.c.f.d. plant is located 13 miles northeast of the Central Alberta town of Rimbey.

Built as a joint venture by 27 companies, the plant will process up to 200 M.M.c.f.d. of raw gas from the Westerose South (Dick Lake) gas field to the north and up to 126 M.M.c.f.d. from the Homeglen - Rimbey field to the south. British American Oil Co., Ltd., a major share owner, operates the plant. (OGJ, Aug. 7, 1961, p. 88). Prime contractor was Poole-Prichard Canadian, Ltd.

Several firsts in Canadian gas processing mark the Rimbey plant. These include:

. . . **Outdoor construction,** which is credited with a major share in lowering plant costs. In addition to saving on buildings, the compact layout made possible by outdoor construction saved on process piping—a major part of any plant's cost. Only equipment housed is that requiring frequent maintenance.

. . . **Hydraulic turbine** in the amine system saves on the amount of power required.

. . . **High - pressure demethanizers** reduce recompression horsepower.

. . . **Air coolers** are used for all process cooling. Therefore, no cooling-water circulation system is required.

. . . **Self-sufficiency** in the matter of utilities.

Since there are producers in each field who have no interest in the other, the incoming gas stream from each field is fed into its own inlet separator and demethanizer. Gas and liquids coming from each are separately metered and sampled. Inlet units are designed for 1,100 psi., and the streams of gas enter the plant at about 950 psi.

Gas - treating. Three 1,100-psi. amine contactors remove acid gases from the main gas stream. A low-pressure contactor removes acid gases from the light-hydrocarbon stream that comes overhead from the condensate stabilizer.

About 2,500 g.p.m. of 20% amine solution is required to remove acid gas from the natural-gas stream. High-pressure rich solution from the amine contactors flows through a hydraulic turbine which drives one of the lean-amine pumps.

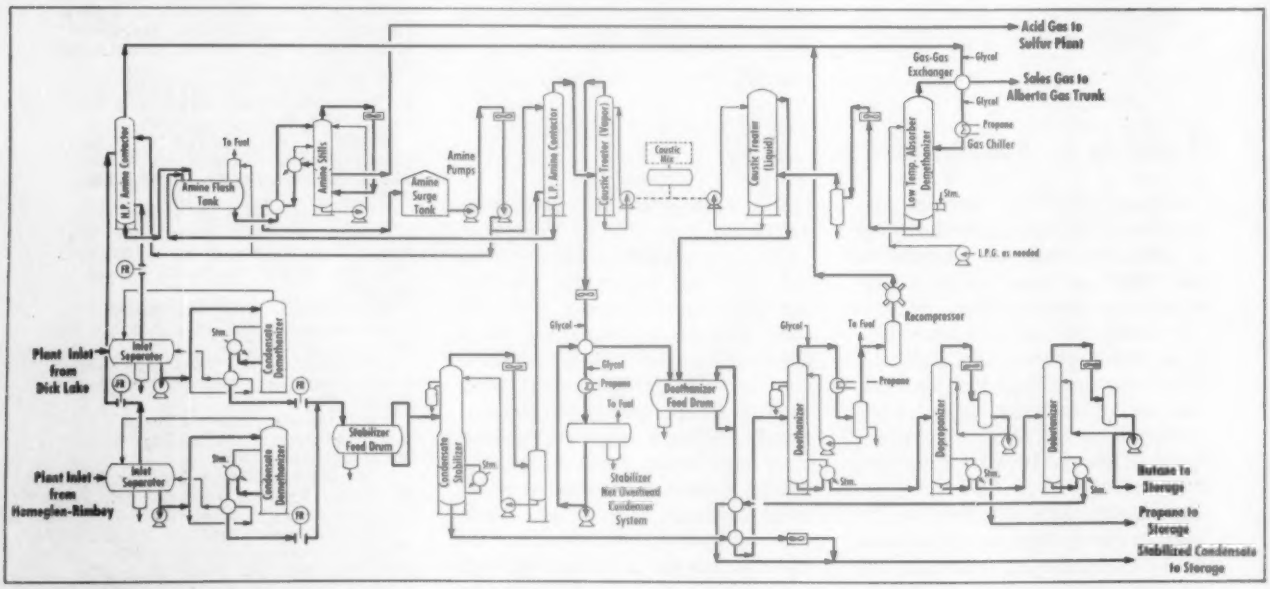
Rich amine is discharged at about 75 psi. to the rich-amine flash tank. Flashed vapors from this tank are scrubbed and sent to the fuel-gas system, while rich amine is fed to the regeneration system.

Dew-point control. Liquids are condensed in two parallel units which use heat exchangers and propane refrigeration chillers to cool the stream.

Water dew point is depressed and ice and gas hydrate formation is prevented in the chilling equipment by injecting a glycol solution into the gas streams ahead of the exchangers and chillers.

Main gas stream plus the condensed liquids enter low-temperature separators where condensed liquids and glycol-water solutions are removed. The gas stream is then recharged to heat exchangers to precool the unchilled gas, metered, and sent to pipeline sales.

Partially demethanized liquid from the low-temperature separators flows to the deethanizer feed drum.



FEATURES OF RIMBEY PLANT includes outdoor construction, hydraulic turbine to save power, high-pressure demethanizers, air coolers, and self-sufficiency in utilities. Centrifugal compressors are used in refrigeration system instead of more conventional reciprocating compressors.

The glycol, separated from the liquid stream, is sent to regeneration.

Refrigeration system uses propane produced in the plant. Propane vapors from the chilling units are compressed in two 2,500-hp. steam-turbine-driven centrifugal compressors. After being condensed in the air-cooled condensed, the propane is self-refrigerated by interstage flashing. The size of the plant made centrifugal compressors especially attractive.

Condensate stabilizer. Here, H_2S and light ends are fractionated from the raw condensate received in the inlet separators. A debutanized natural-gas condensate is the bottoms product. The plant can produce 12,600 bbl. per day of condensate, including the natural-gasoline fraction from the debutanizer. The stabilizer overhead is condensed using refrigeration and sent to the deethanizer feed tank. Uncondensed vapor is used for fuel.

Liquid fractionation. Fractionation is the conventional cascade type. Overhead from the deethanizer which is not required for fuel is recompressed to 950 psi. and sent to the main gas stream.

Overhead from the depropanizer is NGAA specification commercial propane. Daily volume is 86,000 gal. but this can be boosted if needed. Overhead from the debutanizer is 112,00 gal per day of NGAA-specification commercial butane. Bottoms product of the debutanizer is natural gasoline, which is blended with stabilized condensate.

The plant is equipped to return a portion of the propane or butane to the main gas stream and thus increase the recovery of pentanes without breaking the hydrocarbon dew point specification.

Sulfur. Elemental sulfur is produced from the acid-gas stream. Acid gases from the amine-still reflux accumulator are partially burned in sulfur boilers which generate 175-psi. steam. Gases from the sulfur boilers pass through two catalytic reactor stages. The sulfur condensers produce 35-psi. steam.

Molten sulfur is condensed from the reaction gases and collected in a gaging pit from which it can be pumped directly into tank cars or bulk storage. Daily production of sulfur will be about 250 long tons.

Steam and power. The plant generates all of its own electricity with three 1,000-kw. steam-turbine-driven generators.

All coolers and condensers are air-cooled. There is no cooling-water circulation system. Water supply for boilers and general plant use is obtained from wells drilled on the plant site.

Three 100,000-lb. per hour boilers generate 450-psi. steam at about 100° F. superheat. There are three steam levels in the plant: 450-psi. steam is used to drive the various turbine-powered units, 175-psi. steam is used in some heating services, while 35-psi. steam is used to regenerate amine solution for most process heating.

Safety features. Extensive vent, flare, and drain systems have been provided, along with a hydrocarbon stack and burn pit. The fire-protection system includes an underground fire-water system as well as provision for plant alarm and shutdown.

New chart integrator can serve several units simultaneously

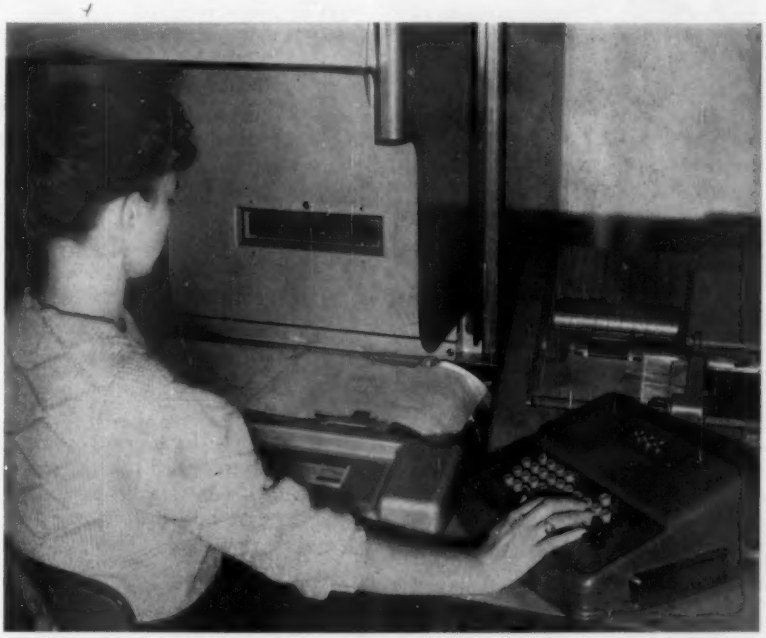
A GAS chromatographic chart integrator which can serve several gas chromatographic units at one time has been developed by California Research Corp.

Cal Research's automatic integrator operates at the rate of 46.2 scans per minute and has a maximum count rate of 1,110,000 counts per minute, higher than any other integrator available. On the average the unit integrates 60 to 80 peaks an hour. Reproducibility for peaks larger than 0.3 sq. in. exceeds 1%.

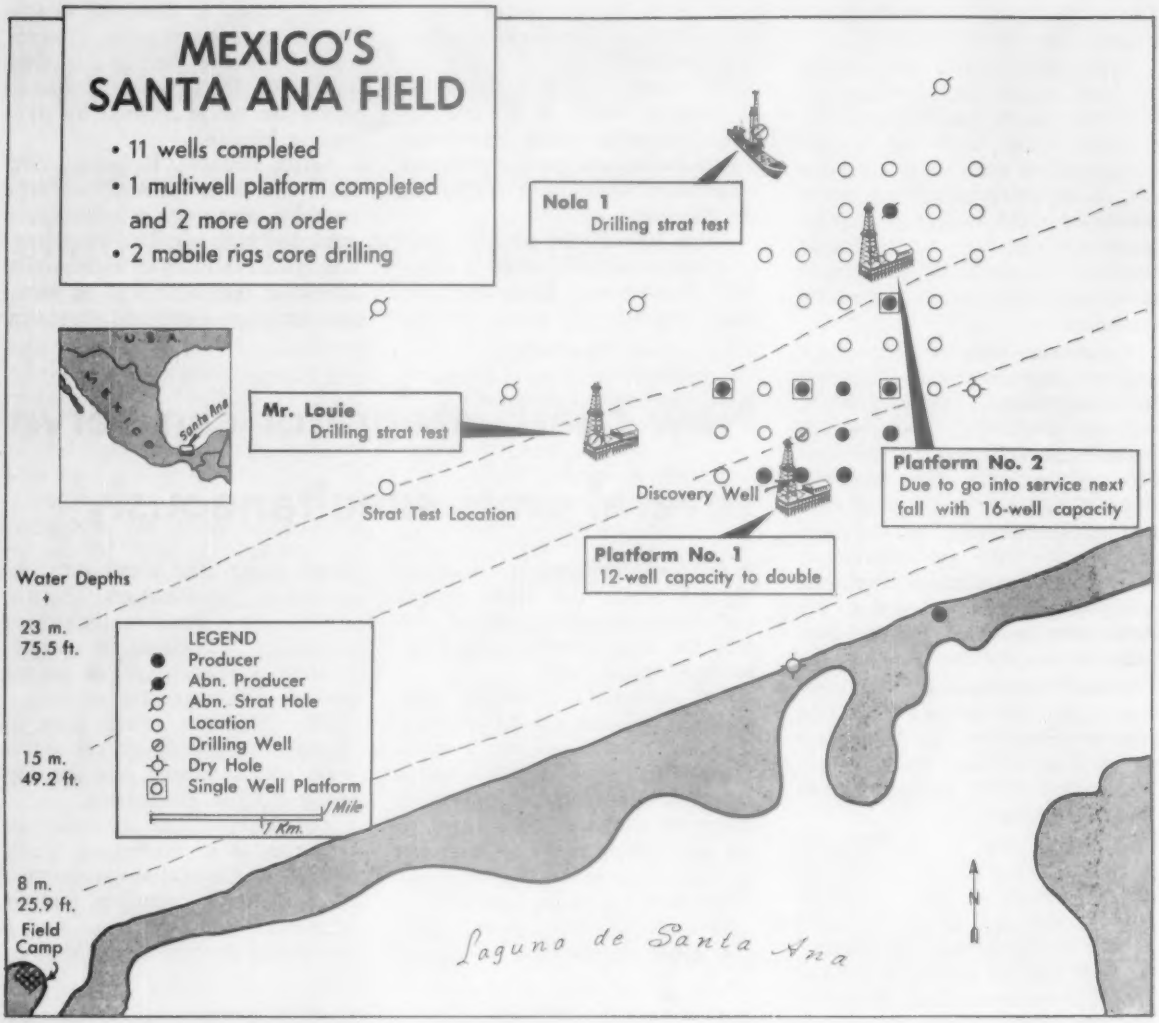
One operator using the new integrator can do the work of several people using hand planimeters, according to Cal Research. The unit also is more accurate than hand planimetry and permits the operator to make adjustments which are not possible with other integrators.

The integrator works from an optical-mechanical system which scans charts moving at a constant speed of 13 in. per minute.

Cal Research has one integrator operating at its Richmond, Calif., laboratory. Calculations are handled by a Datatron calculator and information from the integrator is transferred directly onto IBM cards.



ONE OPERATOR using new integrator can do the work of several using hand planimeters.



Santa Ana: Mexico's No. 2 field?

• Three permanent platforms will be working in field off Mexico by the end of the year. And a big mobile platform and a drill ship are busy punching down core holes to spot locations for other permanent platforms.

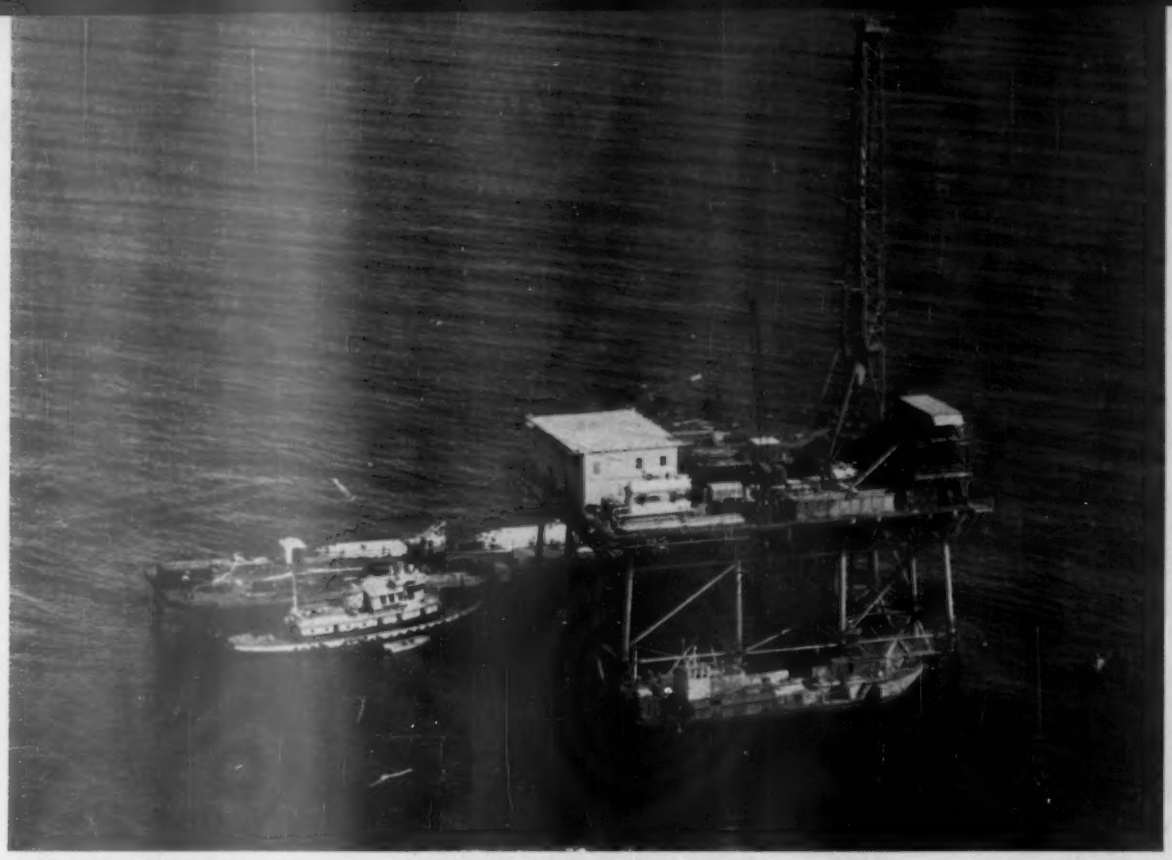
BY CARL LAWRENCE
West Coast Editor

A FULL-SCALE development-drilling program will be launched this fall in Santa Ana field, the flush salt-dome discovery made off the coast of Mexico in the Bay of Campache in 1959.

Three permanent, multiwell platforms will be working in Santa Ana late this year while two mobile rigs are drilling stratigraphic tests in an effort to spot locations for additional platforms. Just how extensive the drilling will be will depend on what the core-hole drilling turns up.

Pauley Pan American Petroleum Co., a subsidiary of Pauley Petroleum, Inc., is developing the offshore field for Petroleos Mexicanos (Pemex), the Mexican Government's oil agency. Continental Oil Co. recently joined with Pauley as a 50-50 partner in certain areas of the isthmus tidelands.

Oil production in Santa Ana was stepped up to about 10,000 bbl. daily in July when a looping program on the field's gathering system was completed. The looped system has a capacity of 40,000 bbl. daily, a production target the



MOST OF DRILLING to date in Santa Ana has been from a 12-well permanent platform. This unit will be expanded to a 24-well platform this fall and two more 16-well platforms moved into field.

field could easily reach within a year at the current rate of growth.

Santa Ana crude moves through the pipeline system to Pemex's big Minatitlan refinery, which is about 45 miles west of the field. Pemex has contracted to buy 25,000 bbl. daily from the field at a posted price of $2.20 for 31° crude.

Drilling plans. There are 11 producing wells in the field, but an additional well will be completed every 30 to 45 days until next fall when two more platforms go into service. The same completion schedule is planned for the second and third platforms.

Here's a rundown on the drilling planned in the field:

... **Permanent platform No. 1** currently is making hole. Capacity was to expanded to 24 from 12 wells in August. This platform is located in 38 ft. of water a mile offshore at the site of the discovery well.

... **Platforms No. 2 and 3** are being fabricated by J. Ray McDermott Co. on the Gulf Coast for shipment late this summer along with the extension of No. 1. The No. 2 unit will be a 16-well structure erected about 2¼ miles offshore. No. 3 platform will have a capacity of 16 wells and will be located in the west portion of the field where several strat holes have been drilled or planned.

The No. 2 platform will be completed about October 1 and No. 3 soon thereafter.

Combined capacity of the three platforms will be 56 wells.

The No. 2 will be located between a well now producing from a single-well platform and an abandoned producer. The latter was abandoned due to damage to surface equipment caused by a severe storm of intensity that occurs only once every 100 years.

The 1960 storm also wrecked a mobile platform drilling in the field and damaged the surface equipment on the discovery well. The discovery well was redrilled from platform No. 1 and the second abandoned well will be redrilled from No. 2.

The new platforms have been designed to withstand the 100-year type storms.

... **Two mobile rigs** will be busy in the field for several months drilling in the west and north parts of the field. The strat holes being drilled by these two units are expected to result in more permanent platforms being moved into the field during the summer of 1962.

The Nola 1, a drill ship operated by Zapata Offshore Co., is drilling its fifth stratigraphic hole. "Mr. Louie," a mobile rig leased by Reading & Bates Offshore Drilling Co., is drilling its second strat test.

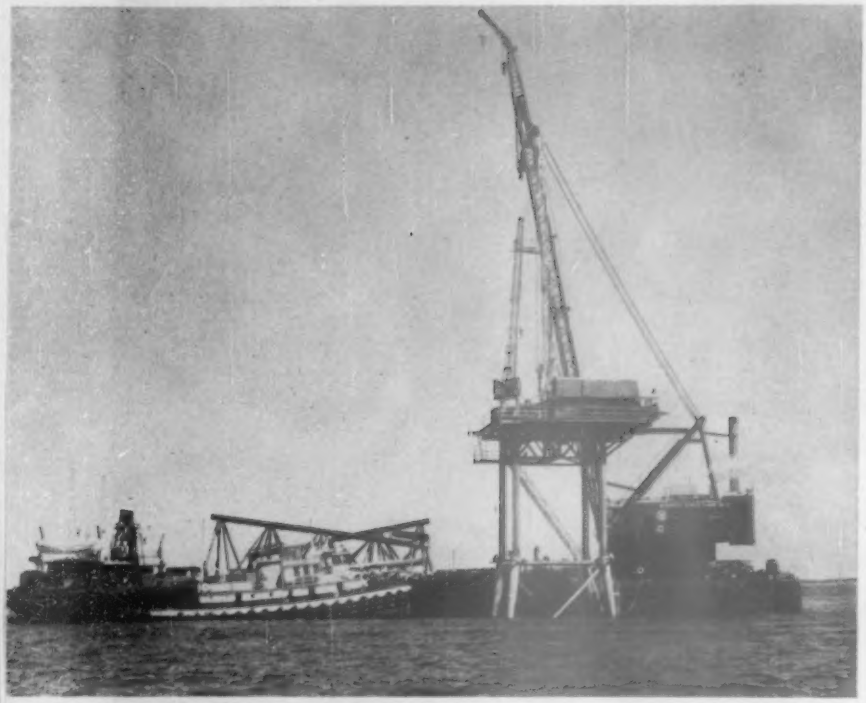
These drilling plans call for at least three rigs to be running in the field this fall as well as the two mobile rigs doing core drilling.

Bids are now out to drilling contractors for work on the third platform. Permargo, a Mexican drilling contractor, has the contract for the first platform and recently was awarded the contract for the second.

Geology. Santa Ana ranks as one of the best discoveries made recently in Mexico.

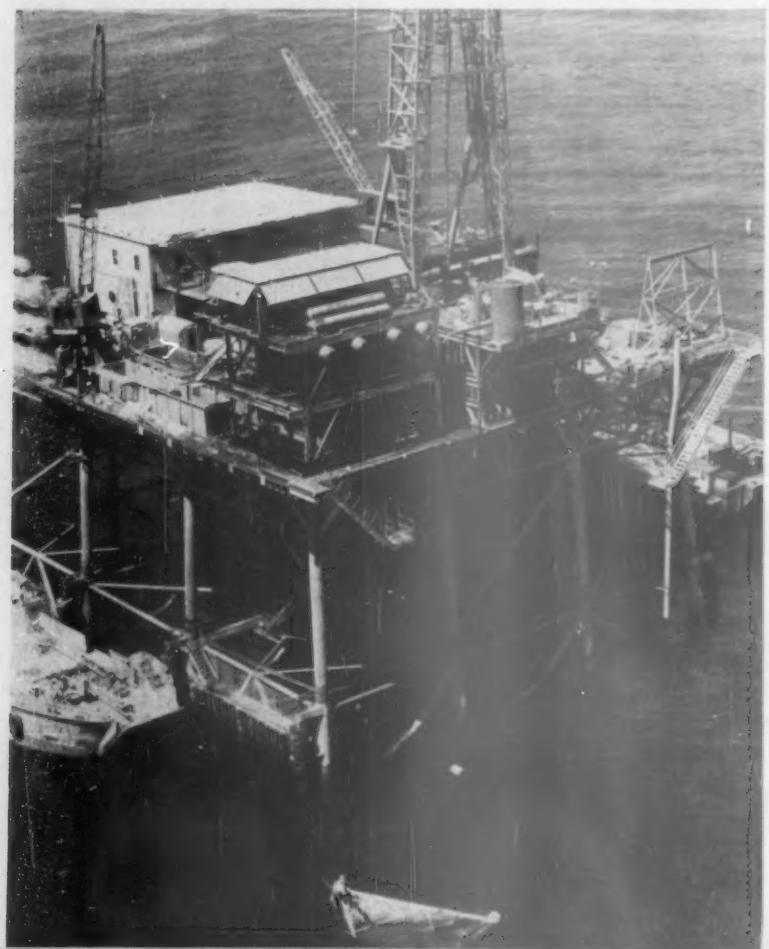
The location for the discovery well was staked following a careful study of the seismic interpretation of three organizations. Two marine seismic programs were involved, one in 1948 and the other early in 1958.

The 11 wells completed in the



WORKOVER RIG is busy on one of the four single-well platforms in field. Early drilling was done from these small platforms.

EVIDENCE OF DAMAGE done by severe storm of 1960 is found near Santa Ana's permanent platform. Damaged surface structure of discovery well (lower part of photo) is near platform. Discovery well has been redrilled from big platform.



field have proved up 21 pay zones and have an average of 140 ft. of oil sand. One well has nine pay zones.

The field is a deep-seated salt-dome structure similar to those found off Louisiana. Santa Ana produces from two formations, the Concepcion in the lower half of the Middle Miocene, and the Encanto in the Lower Miocene. The crude ranges from 20° to 38° gravity with an average pipeline gravity of 31°. Drilling is on 40-acre spacing.

The discovery well was completed as a 1,550-bbl. well based on a 20-minute production test of two zones in the Encanto. All of the wells are capable of producing 500 bbl. daily per zone through a ¼-in. choke.

Of the 21 zones in the field, the most shallow production is from 3,445 ft. (1,050 m.) and the deepest from 9,242 ft. (2,817 m.).

Of the four dry holes drilled in the field, three were drilled from the same onshore drill site a mile south of the discovery. One of these was a straight hole and the others whipstocked to shallow depths offshore.

The Santa Ana wells are being completed as dual and triple producers where possible. Of the 11 completed producers, only one is a single-zone completion. Six are dually completed and four are triple completions.

No. 2 in Mexico? Although it is too early to make a firm prediction of just how big Santa Ana will be, the early success in the field points to the prospects of the field becoming Mexico's No. 2 crude producer.

With a daily production of between 10,000 and 12,000 bbl. daily, it would probably outrank many of Mexico's fields. Once it hits 25,000 bbl. daily, it will be pushing the country's second-rank producer, San Andres field in Poza Rica district 250 miles up the coast to the north and west of Santa Ana. San Andres produced an average of 28,841 bbl. daily during the first 6 months of last year.

Mexico's biggest field is Poza Rica, the big 1930 discovery which currently is making slightly over 70,000 bbl. daily. Poza Rica boasts a cumulative record of 774 million barrels of crude.

Are your lifting efficiencies below par?

Maybe systematic checking with sonic devices and dynamometers will bring about better performance

BY F. L. HART
Gulf Oil Corp., Monahans, Tex.

HIGH EFFICIENCY is one of the industry's best tools to regulate producing costs, and gain a favorable economic atmosphere.

In oil-producing operations we have seen other tools such as automatic well testers, LACT units, b.s. and w. monitors, gravitometers, and many others involving automation. But, while the handling of oil has received much attention, we frequently overlook the chance to improve efficiency in equipment we already have.

Oil-lifting equipment will remain one of the industry's chief liabilities unless handled in a systematic, logical, and economical manner with the tools presently available, namely the dynamometer and sonic detector.

Sonic detector. This is sometimes called an echo meter, or fluid-level machine. By using this instrument in a logical way and becoming familiar with each well's behavior, a shooting program can be set up which will give information about down-hole-equipment efficiency.

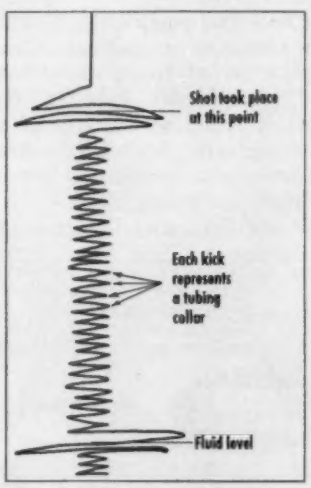
The machine is simple to operate. After a few hours' experience it is possible for one operator to trouble shoot approximately 40 wells in an 8-hour period. This feat, however, is overshadowed by the economic importance of the information gathered.

How it works. The sonic detector operates on the principle of echo speed and volume. The shot consists of a blank cartridge fired down the casing. The sound wave created is echoed back to a microphone by each tubing collar. Microphone sensitivity is designed so that only the initial strong echoes from each collar are received. Sounds are transmitted to a recording instrument where a stylus records each echo as a volume surge on a strip chart. When fluid is reached by the sound wave a louder echo is produced causing a more pronounced kick on the strip chart, Fig. 1.

At the end of the day's shooting, the operator, with the aid of 11 point dividers, is able quickly to count the number of collars above fluid. The number of joints of tubing to the seating nipple and the seating nipple's depth is on record. The average length of each joint has been previously calculated and recorded for each well.

Surface inspection of a well tells little about down-hole-equipment efficiencies. A fluid-level shot, however, will reveal troubles before they become severe enough to be apparent at the surface. After pumping equipment has been correctly adjusted to obtain maximum pumping efficiency, any partial failure immediately becomes apparent by a rise in fluid level.

I believe that optimum fluid level for continuously produced wells should be between 200 and 300 ft. above the seating nipple. Levels higher than this will produce unnecessary back pressure on the formation face, limiting well-bore entry and decreasing efficiencies. However, such a level will be high enough to allow for entry variations and assure pump fillup at high production rates.



SONIC DETECTOR strip chart to determine amount of fluid in the annulus. Fig. 1.

Shortcomings of this instrument can cause a great deal of distress if they are not understood. Since the operating principle employs an echo, it is evident that any echo-producing object in the well can cause erroneous data. Such objects do exist in the form of salt rings, foam, paraffin, or bridging of the formation.

There is no simple way to eliminate these false readings. But the fact that they are false becomes obvious after you have become familiar with the pecularities of each well. Steps such as watering the casing, closing the casing valve for a few hours to dissipate foam, or dissolving the paraffin, will condition the well for best readings.

A high fluid level on a well that has previously pumped efficiently indicates the following possible problems:

- Traveling valve or standing valve leaking.
- Starved pump.
- Leak in the casing check.
- Tubing leak.
- More fluid coming into the well bore.

The operator should then use a dynmometer to help pinpoint the cause of the trouble, eliminating unnecessary tubing jobs or pump replacement caused by misinterpretation.

A dynamometer will give a quick and accurate record of the pump's condition. Leaking valves or starving of the pump, from clogged tubing perforations, are readily detectable. Therefore, the first two problems are directly checked with the dynamometer.

Should the pump prove to be in good condition it becomes a simple matter to pinpoint the other ills by checking production data and calculating pump efficiency at 80%.

If the well is producing at less than 80% efficiency we immediately inspect the casing check for

possible malfunction causing circulation. Should the check prove to be in good condition we know there is a tubing leak and without unnecessary expense can rig up to pull rods and tubing in one operation. Thus the correct decision to a most erratic problem has been discovered in a few minutes.

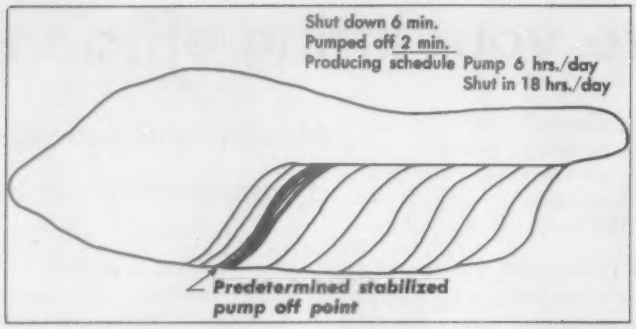
Should the efficiency be 80% or greater we could have taken steps to lengthen the stroke or speed up the well to produce the additional fluid we find entering the well bore. This final step is valuable in producing a water flood where increased production is quite sudden and producing efficiency extremely important.

Not only can a trouble such as leaking valves in an insert pump be readily detected by the dynamometer, but by using the step method of valve checks, Fig. 2, the most economical time can be selected to change the pump.

The step method is begun by pulling the rotating string on the card drum, thus turning the drum to a point below the stylus' normal travel. As fluid leaks past the valves a weight differential will be inscribed on the card. A traveling-valve leak will show up as a decrease in weight and a standing-valve leak will record an increase in weight as fluid leaks past these valves.

Thus valve leakage is readily detected, but to determine severity of valve damage we must arrive at the rate of leakoff from each valve. Slightly releasing the drum string each 5 seconds will give a direct record of the time interval on the dynamometer card. Fluid-weight leakoff can thus be measured, time for the weight increase or decrease is recorded, and percentage leakoff per second can be calculated.

It is then possible to multiply the percentage loss per second times the seconds per half stroke and arrive at loss percentage during each half stroke. In case both valves leak, total percentage leakoff and actual per cent loss per stroke can be calculated.


Shut down 6 min.
Pumped off 2 min.
Producing schedule Pump 6 hrs./day
Shut in 18 hrs./day
Predetermined stabilized pump off point

CYCLE DETERMINATION for intermittent producers. When the stylus reaches the predetermined cutoff point on the second cutting of the card, the producing time is recorded. Fig. 3.

Intermittent producers can thus be regulated to economically produce all the fluid entering the well bore by increasing the pumping time by a calculated amount. This method not only gives the operator the chance to gain full value from his pump, but also guards against a poor guess of producing time increase. This could result in fluid pound with possible rod parts or pump damage.

Such a well should be frequently checked with the dynamometer and fluid level. Once the leakage has begun the efficiency will continue to decline. When a point is reached where fluid begins to rise in the well bore and the well is being pumped 24 hours per day this economic limit has been reached and the pump should be changed.

Check that pump cycle. Intermittent producers are particularly good application of the sonic detector and dynamometer. First, the fluid level is found at the end of the pumping cycle. It should be found in the annulus between 30 and 100 ft. above the seating nipple.

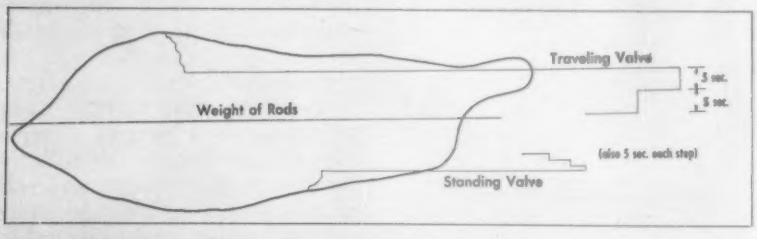
If the fluid level is higher than 100 ft., the well is placed on continuous production until the pump-off condition is noted at the surface. The dynamometer is then placed on the well for trouble determination.

On the first card the valves are checked and measurements taken to determine the length of stroke and strokes per minute. If the valves prove to be faulty we realize this is possibly the cause for the high fluid level. A pump change is scheduled for the well. If the pump is operating efficiently we know that we have an improper cycle or circulation is occurring from tubing or casing check leaks. It is then necessary to cut an additional card and determine the proper cycle.

After the new card is placed in the dynamometer the well is allowed to pump off while cutting the card. When it has pumped off to a stabilized point the well is shut down for a period of 6 minutes.

At the end of the shut-in period the well is started again and the time required to pump off to the predetermined point is noted, Fig. 3. Down time to pumping time thus gives us a fraction which indicates fluid entry into the well bore. By extrapolating this fraction to a 24-hour day, we arrive at the number of hours the well should pump to obtain the most efficient cycle.

Since the high fluid level could have been caused by down-hole-equipment leaks, it is necessary to determine production at 80% efficiency based on the old cycle. If the equipment is functioning properly we can immediately place the well on the new pumping schedule. If not, we discard the cycle determination card and begin our systematic inspection as in the case of continuous producers.



STEP METHOD for finding optimum pump change time. This card shows leaking traveling valve, and percentage of leakoff per unit of time can be easily found. Fig. 2.

Fluid levels below 30 ft. indicate that less fluid is entering the well bore. In this case the operator must only determine the new cycle and incorporate it in the pumping schedule.

Since this practice of determining optimum cycles is based on information gathered at a pumped-off condition it is apparent that as the fluid rises in the annulus during down time, a back pressure will be placed on the formation, thus restricting fluid entry. For this reason it is necessary to regulate the new cycle in such a manner that several short pumping periods take place each day.

Buy 'em and use 'em. Too few operators realize the advantages of having data from dynamometer and sonic detector equipment. For this reason they find it hard to justify the cost of these tools.

However, if these instruments are used in a logical and systematic manner their data will be invaluable to efficient and economical lease operation. Their use takes the guesswork out of trouble determination. Instead, the operator has a definite procedure to follow.

Lease operation without the proper tools to determine the origin of trouble is one of the key factors in wasteful spending. For example, consider the case where tubing was leaking, the well was circulating causing production to drop, and no dynamometer or fluid level instruments were available to help determine the trouble. Such a condition can easily be misinterpreted as a faulty pump. After figuring the cost of pulling the well, repairing the pump, and the value of production lost during workover operations, it is not at all uncommon for the operator to find that the money wasted represents nearly 4% of the purchase price of these two instruments and the vehicle used in their operation. For water-flood production the loss can be much greater.

Considering the cost of each well, from exploration to completion, it is hard to realize that an operator is hesitant to purchase relatively inexpensive tools which will permit him to economically produce these wells. And it is equally absurd to own the equipment without taking advantage of its potential.

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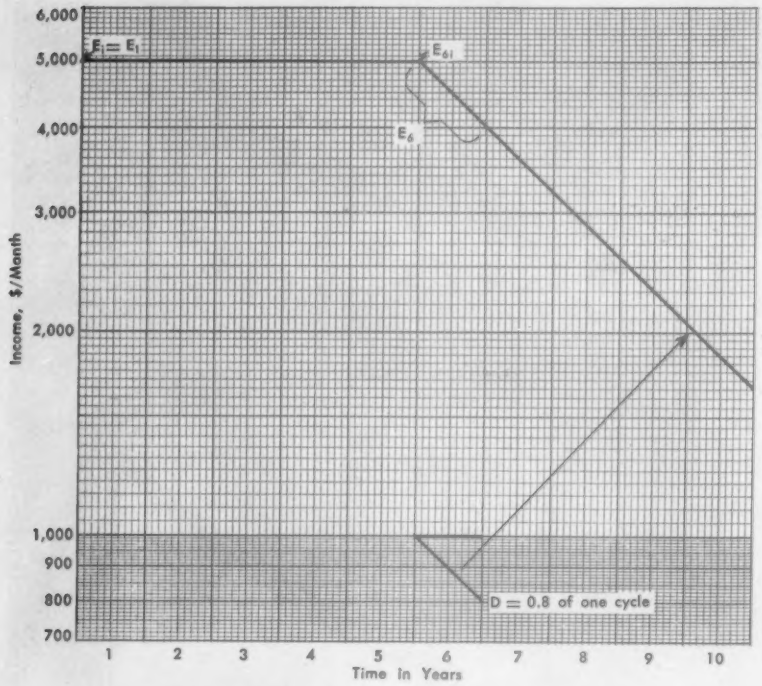


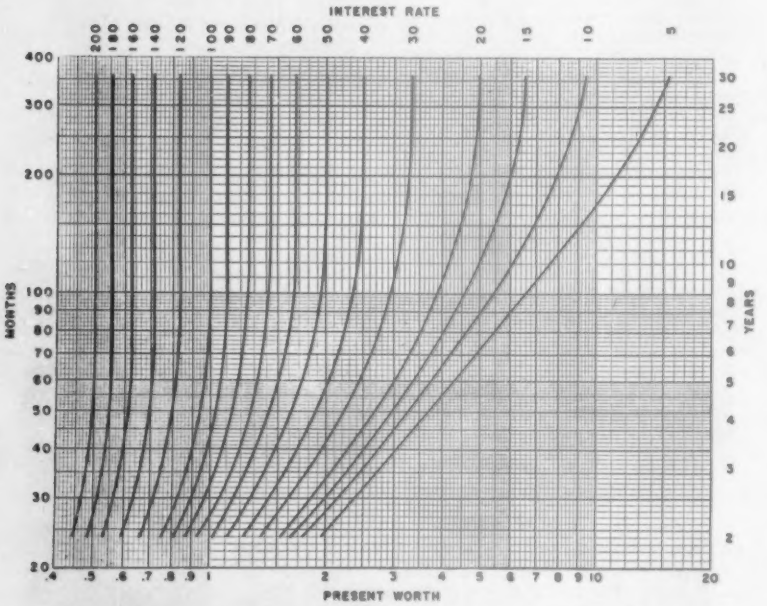
TYPICAL FORECAST of income versus time. Fig. 1.

A new method for

Calculating rate of return

of oil and gas drilling investment

BY HAYWARD H. HILL
Sinclair Oil & Gas Co.
Tulsa



EQUAL SERIES present-worth factors, annual compounding. Fig. 2.

THE CALCULATION of rate return for income from oil and gas properties is complicated by the fact that such income seldom remains constant over the entire producing life of the properties. A decline in production is characteristic of nearly all producing properties sometime during their economic life.

The constant percentage, or exponential decline curve, which is widely accepted in the oil industry, has the same mathematical form as the compound discount equations. Because of this similarity, it is possible to set up relatively simple equations for present worth of declining income and, thereby, determine rate of return.

The method is applicable to projects having various combinations of constant and declining incomes and to various interest-compounding periods.

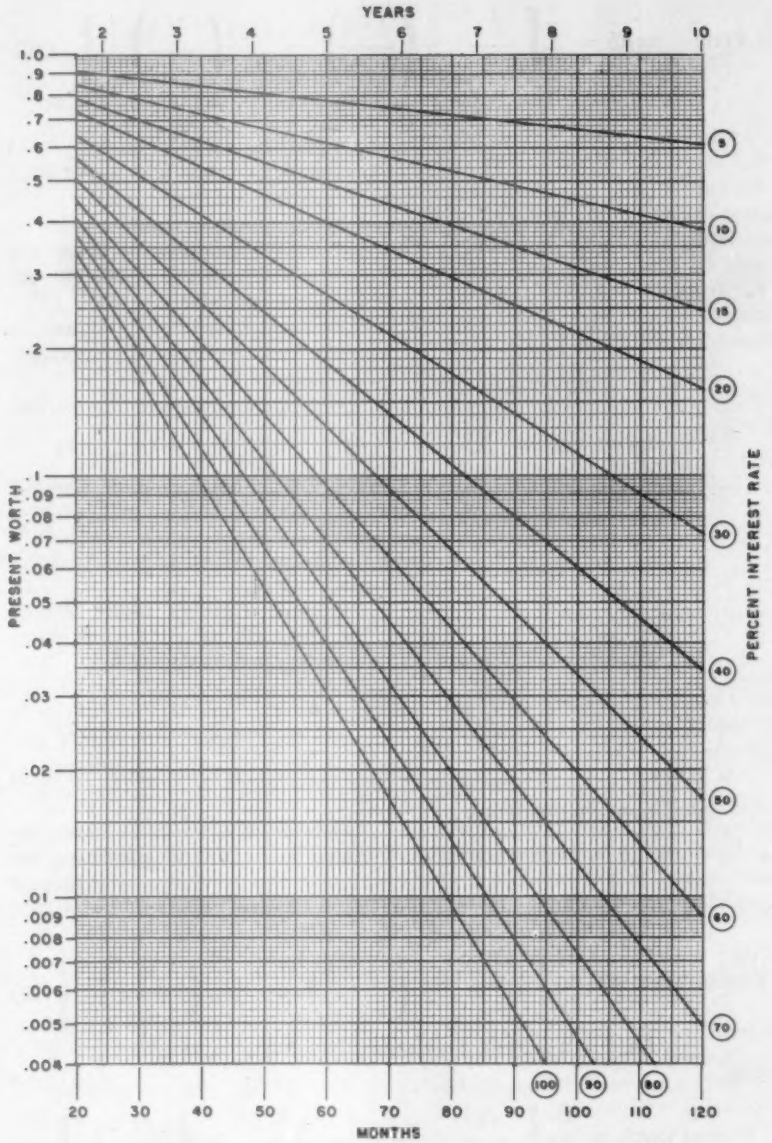
New method needed. A quick and efficient method of evaluating the economics of individual drilling projects is becoming more important in view of continued rising costs. The discounted cash flow, or rate-of-return method of evaluation, is considered to be efficient. The chief disadvantage to this method is the extensive trial-and-error calculations necessary.

In 1957, Glanville[1] discussed the advantages of the rate-of-return method over such time-honored evaluation methods as **payout time** and **profit-to-investment ratios.**

Later, Arps[2] pointed out the fact that calculation of rate of return by trial and error was a laborious process and suggested the use of two interest rates similar to Hoskold's method and solving for an "average annual rate of return."

This study suggests another approach to the rate-of-return calculation by using present-worth factors in conjunction with production-decline-curve formulas. Rate of return may then be calculated for (1) constant income rate, (2) income rate declining exponentially, and (3) any combination of (1) and (2). The compounding period may be annual, monthly, or continuous.

Project analysis. The economic analysis of a proposed oil or gas well begins after the future oil and gas reserves have been determined



SINGLE-PAYMENT present-worth factors, annual compounding. Fig. 3.

and the initial rate of production estimated. Knowing the unit selling price of oil and gas together with the various operating expenses, expressed in dollars per unit of production, the future net income from the well may then be projected in time as a direct multiple of producing rates.

Some economists prefer to consider the operating costs in terms of a fixed amount per month or per year over most of the life of the project. At any rate, the projection of gross or net income versus time will normally fall into one of the following types:

1. One or more constant rates of income over the life of the project.

2. One or more constant rates of income followed by one or more declining rates.

3. One or more declining rates of income.

Decline-curve equations and present-worth equations may be combined to implement the calculation of rates of return.

Decline-Curve Equations

Decline-curve analysis has indicated that the exponential decline (while not strictly accurate from the reservoir engineer's viewpoint) has found wide use in the oil industry due to its simplicity and ease of handling.[3,4] For the purpose of forecasting production prior to drilling, it seems to be sufficiently accurate.

For exponential decline of a producing rate or an income rate, E, each succeeding income rate is a constant percentage of the income rate just before it.[5] The total income, I, therefore, is expressed as a geometric progression:

$$I = E_1 (1 + D + D^2 + D^3 + \ldots + D^{n-1}) \quad (1)$$

$$= E_o (D + D^2 + D^3 + \ldots + D^n) \quad (2)$$

Where:

E_1 = income during first unit of time

D = common ratio, or constant percentage-decline factor per time unit, sometimes called "loss ratio"

n = number of time units in the series

$E_o = E_1/D$.

Substituting E_1/D for E_o in Equation 2 and rewriting:

$$ID = E_1 (D + D^2 + D^3 + \ldots + D^n) \quad (3)$$

Then, to determine total income, subtract (3) from (1) and solve for I:

$$I - ID = E_1 (1 - D^n) \text{ and } I = E_1 \frac{1 - D^n}{1 - D} \quad (4)$$

The income during any time period n, is $E_1 D^{n-1}$ (5)

Records of oil and gas production are normally maintained on a monthly basis and occasionally on an annual basis. Forecasts are conveniently made on an annual basis and sometimes on a monthly basis. Inspection of Equations 1, 2, or 3 reveals that the relation between monthly and yearly decline is:

$$(D/\text{month})^{12} = D/\text{year}, \quad (6)$$

since, in a series of monthly rates, there will be 12 times as many terms as in an equivalent series of yearly rates.

Continuous equations. Equations 1-6 are discrete rather than continuous, and, are popular because records of oil and gas production and income are usually maintained on a monthly or yearly basis. However, the decline curve expressed in continuous form has some important

applications. The type of decline curve in Fig. 1 may be expressed in exponential form:

$$E = E_i\, e^{-Dc\, n} \qquad (7)$$

Where:

E = income rate at time n

E_i = initial income rate at first instant of decline

Dc = mathematical slope of line, or instantaneous decline factor

e = base of natural logarithms.

Equation 7 is equivalent to the discrete equations provided $e^{-Dc} =$ D per month or D per year depending on the units being used. Total income I is found by integrating Equation 7.

$$I = \int_0^n E_i e^{-Dc\, n}\, dn$$
$$= -E_i/D_c\, (e^{-Dc\, n})_o^n$$
$$= E_i/D_c\, (1 - e^{-Dc\, n}) \qquad (8)$$

The relation between D per year and D_c is:

$$D \text{ per year} = e^{-Dc} \qquad (9)$$

Equations 1 through 8 are all correct and can be used interchangeably, provided consistency of units is maintained and the appropriate value of D is used. Table 1 contains equivalent values of D for yearly, monthly, and instantaneous declines.

TABLE 1—EQUIVALENT VALUES OF DECLINE FACTORS, D

D_y (per year)	D_m (per month)	D_c (instantaneous*)
0.95	0.9957	0.05130
0.90	0.9912	0.10537
0.85	0.9865	0.16252
0.80	0.9816	0.22314
0.75	0.9763	0.28769
0.70	0.9706	0.35668
0.65	0.9647	0.43079
0.60	0.9581	0.51083

*To be used with annual rates of income. For monthly rates of income, divide the tabulated values by 12.

When using the discrete equations, the income during the first time period must be known or estimated. This value can be determined graphically or by use of the instantaneous rate Equation 8. For example, Fig. 1 displays a constant income rate for 5 years followed by a declining income rate for 5 years, where D = 80% per year.

After the decline sets in (during the sixth year,) succeeding year's rates are 80% of the previous year's rates except for the first year of the declining portion. The midpoint of year six reads 4,480 per month or 12 × 4,480 = 53,760 per year. If greater accuracy is desired, use Equation 8:

$$D_y = e^{-Dc} = 0.80$$

$$D_c = 0.22314$$

E_i = \$5,000 per month or \$60,000 per year

E_6 = I for the sixth year

$$= \frac{E_i}{D_c}\left[1 - e^{(-Dc)\,(11)}\right]$$

$$= \frac{60{,}000}{0.22314}\,(1 - 0.8) = \$53{,}778.$$

Present-Worth Equations

Equal-series compound-interest factors can be expressed as geometrical progressions of the same form as the decline-curve equations. The progressions for exponentially declining income may, therefore, be combined with the progressions for present worth, provided that consistency of time units is maintained.

This means that if the income is expressed in dollars per month, the interest rate must be in per cent per month, compounded monthly. If continuous compounding is desired, then declining income must be expressed in terms of instantaneous rates.

The present worth of a series of equal earnings is determined[6] by:

$$\text{Present worth} = E_1\left[\frac{1}{1+r} + \left(\frac{1}{1+r}\right)^2 + \ldots + \left(\frac{1}{1+r}\right)^{n1}\right] \qquad (10)$$

$$= E_1\,\frac{1 - (1+r)^{-n1}}{r} \qquad (11)$$

Where:

E_1 = amount of earnings per time period, received in a single sum at end of each time period

n_1 = number of time periods in series; also number of compounding periods

r = interest rate per time period.

The term, $\dfrac{1 - (1+r)^{-n1}}{r}$, is known as the equal-series present-worth factor and will be referred to hereafter as PW_{n1r}.

Present worth of future income for the case of continuous compounding is determined[7] by:

$$\int_0^n e^{-nr}\, dn = -1/r\,(e^{-nr})_o^n$$
$$= 1/r\,(1 - e^{-nr}) \qquad (12)$$

The present worth of future income, in discrete quantities, declining exponentially, is expressed by combining Equations 2 and 10:

$$\text{Present worth} = \frac{E_1}{D}\left[\frac{D}{1+r} + \left(\frac{D}{1+r}\right)^2 + \ldots + \left(\frac{D}{1+r}\right)^n\right] \qquad (13)$$

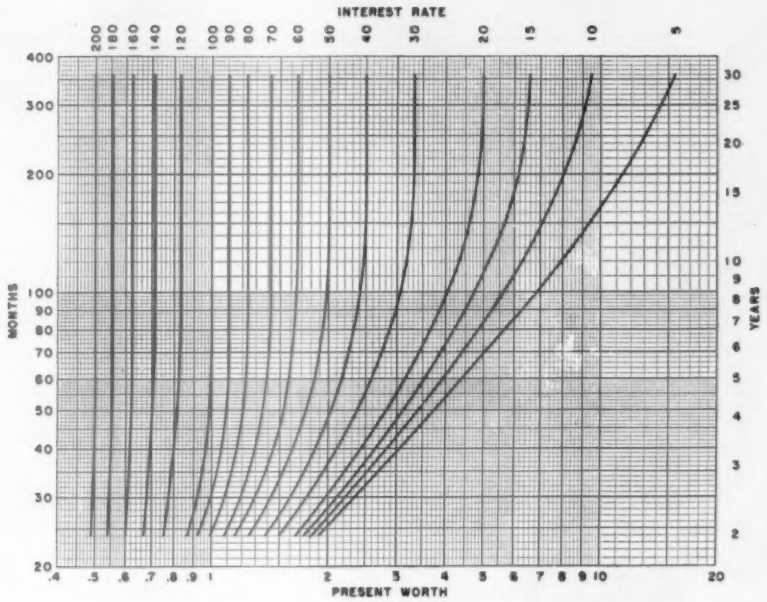
Let $1 + r = D\,(1 + x)$, then $1/(1 + x) = D/(1 + r)$

and

$$\text{Present worth} = \frac{E_1}{D}\left[\frac{1}{1+x} + \left(\frac{1}{1+x}\right)^2 + \ldots + \left(\frac{1}{1+x}\right)^n\right] \qquad (14)$$

which is identical to the expression for the equal-series present-worth factor for x interest. This means that the present worth and rate of return of exponentially declining income may be calculated in one operation using an equal-series present-worth factor after substituting x for r as in Equation 13. The interest rate x combines the effect of the discounting process and the declining nature of the earnings.

If monthly rates and monthly declines are used in the forecast, the interest rate would have to be divided by 12 to maintain consistency and Equation 13 would be:



EQUAL-SERIES present-worth factors, continuous compounding. Fig. 4.

$$\frac{1}{1 + x/12} = \frac{D_m}{1 + r/12}$$

then

$$x = (12 + r)/D_m - 12 \text{ and } r = (12D_m(1 + x/12) - 12 \quad (15)$$

where

x and r are in per cent per year and D_m is monthly decline.

For instantaneous rates and continuous compounding, Equations 8 and 12 are combined and integrated:

$$\text{Present worth} = E_1 \int_0^n e^{-Dc\,n}\, e^{-rn}\, dn$$

$$= E_1 \int_0^n e^{-n\,(Dc + r)}\, dn$$

$$= \frac{E_1}{D_c + r}[1 - e^{-n(Dc + r)}] \quad (16)$$

which is identical to the equal-series present-worth factor for an interest rate $x = D_c + r$.

Rate of Return

It is now possible to calculate the rate of return directly for either a constant earning rate or an earning rate which is declining exponentially. For a constant earning rate, E_1 dollars per year for n years, after an original investment C dollars:

$$E_1\,(PW_{nr}) = C, \text{ and } PW_{nr} = C/E_1$$

PW_{nr} for n years is located in tables or on a chart as in Fig. 2 and the corresponding interest r is the rate of return.

For an earning rate declining exponentially D per year from an original value of E_1 for the first year:

$$\frac{E_1}{D}(PW_{nx}) = C, \text{ and } PW_{nx} = DC/E_1$$

The interest rate x is determined as in the case of constant earning rate, and the rate of return is then $r = D(1 + x) - 1$.

Rate combinations. Where the forecast consists of combinations of constant and declining rates, the present worths of each constant rate and each declining rate are calculated, deferred back to zero time, and equated to the original development cost. This procedure requires a trial-and-error approach, but is considerably easier than discounting year by year.

For example, suppose the original development cost of a well is C dollars, and the net income is estimated to be E for n_1 years, after which the income declines by a factor of D per year for n_2 years from an initial rate E′ per year. Equating present worth of net income to development cost:

$$E\,(PW_{n1r}) + \frac{E'}{D}(PW_{n2x})\frac{}{(1 + r)^{n1}} = C$$

The value of r that satisfies this equation is the rate of return. Any term after the first one in an equation such as the above, must contain the single payment deferment factor $1/(1 + r)^{n1}$ in order to defer the amount back to zero time. The deferment factor PW_{n2x} only defers the amount back to the beginning of the time period represented by n_2.

Care must be exercised in selecting the initial income rates of a declining portion. In the discrete equations, the initial rate will be the income **during** the first month or first year of the decline. In the continuous equations, the initial rate will be the instantaneous rate of income at the first **instant** of the decline. In the example to follow, E_n will represent the income during the n^{th} month or the n^{th} year; and E_{ni} will represent the instantaneous rate at the beginning of the n^{th} year.

Calculating Procedure

Two charts, Figs. 2 and 4, show time in months and years versus equal-series present-worth factors, from r equal 5% to 200%. Actual rate of return is usually less than 50%. The higher rates are necessary for calculating present worth of declining income.

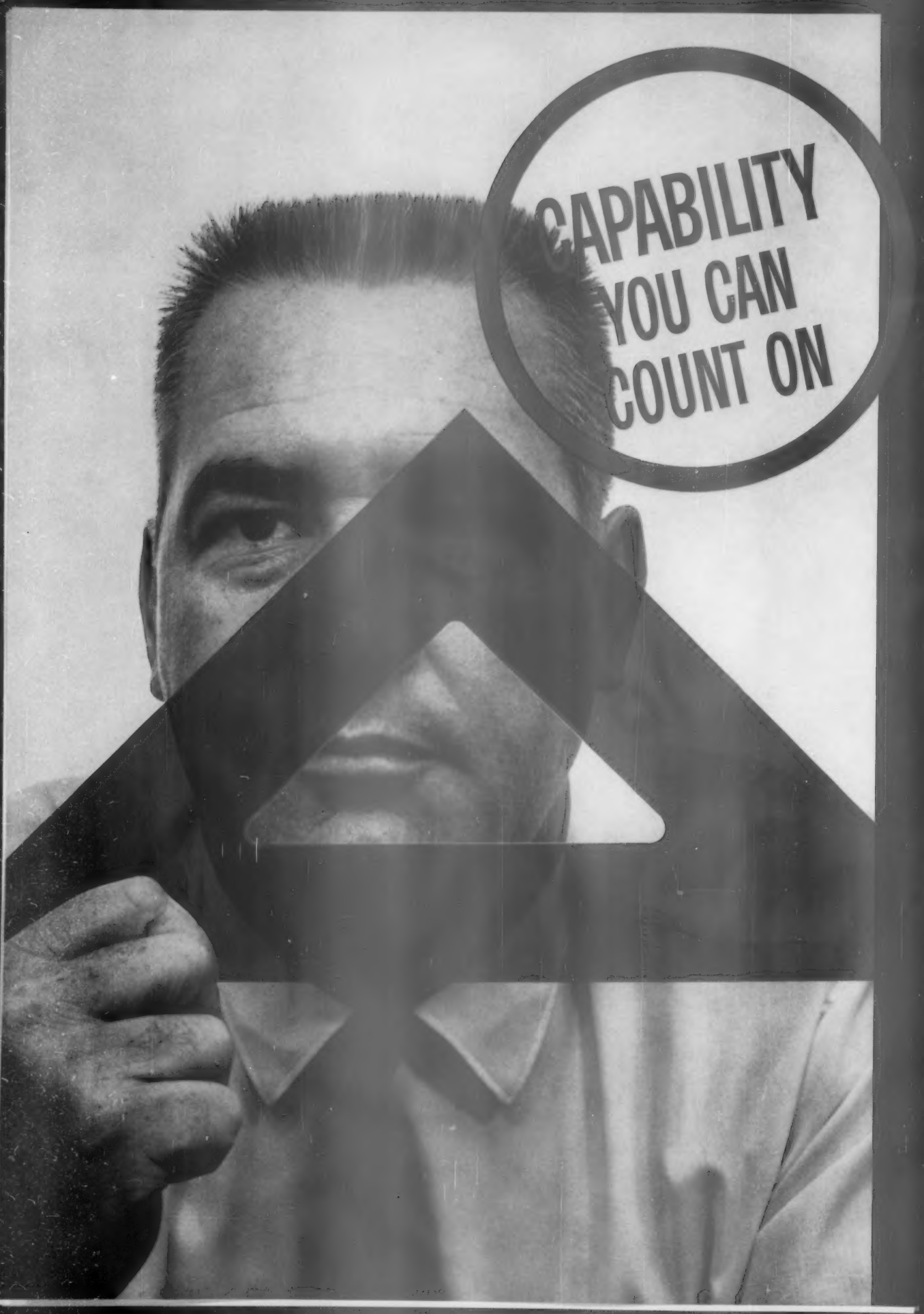
Fig. 2 is a chart of present-worth factors for annual income received in a lump sum at the end of each year, the interest being compounded annually. The curves were calculated from Equation 11 where r is in per cent per year and n in years.

Fig. 4 is a chart of present-worth factors for annual rates of income compounded continuously. The curves were calculated from Equation 12.

Figs. 3 and 5 are charts of single payment deferment factors. These factors defer a single amount back to zero time.

Example. A well will cost $200,000 to complete. Net income from production is estimated to be $60,000 per year for 5 years after which the income will decline by a factor of 80% per year for 5 years. (See Fig. 1.)

$C = 200{,}000$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$E_1 = E_1 = \$60{,}000$ per year or $5,000 per month

$D = 0.80$ per year, 0.9816 per month, 0.22314 instantaneous (From Table 1)

$n_1 = 5$ years or 60 months

$n_2 = 5$ years or 60 months.

Income during the sixth year (first year of decline) is:

$$E_6 = E_1/D_e\,(1 - e^{-De\,0.1}) = \frac{60{,}000}{0.22314}(1 - 0.8) = \textbf{\$53,778 per year}$$

It would usually be satisfactory to determine initial rates of a decline, such as E_6 by graphical means.

Rate of return, annual compounding: The interest rate that satisfies the following relation is the rate of return:

$$E_1\,(PW_{n1r}) + \frac{E_6}{D}(PW_{n2x})\frac{1}{(1+r)^{n1}} = C$$

Let $r = 0.20$, then $x = \dfrac{1.2}{0.8} - 1 = 0.50$ (From Equation 13)

Substituting r and x in the above relation and entering the appropriate present-worth factors from Fig. 2:

$$60{,}000 \times 2.99 + \frac{53{,}778}{0.8} \times 1.73 \times 0.4 = 179{,}400 + 46{,}518 = \textbf{\$225,918}$$

This value is greater than 200,000, so the next choice of interest will be higher for greater discounting effect.

Let $r = 0.30$, then $x = \dfrac{1.3}{0.8} - 1 = 0.625$

$$60{,}000 \times 2.45 + \frac{53{,}778}{0.8} \times 1.47 \times 0.269 = 147{,}000 + 26{,}582 = \textbf{\$173,582}$$

Interpolating:

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$$r = 20\% + 10\,\frac{225{,}918 - 200{,}000}{228{,}918 - 173{,}582} = \mathbf{24.95\%}$$

Rate of return, continuous compounding:

$$E_i\,(PW_{n1r}) + E_{6i}\,(PW_{n2x})\,\frac{1}{e^{n1r}} = C$$

Let $r = 0.20$, then $x = 0.20 + 0.223 = 0.423$

$60{,}000 \times 3.14 + 60{,}000 \times 2.08$

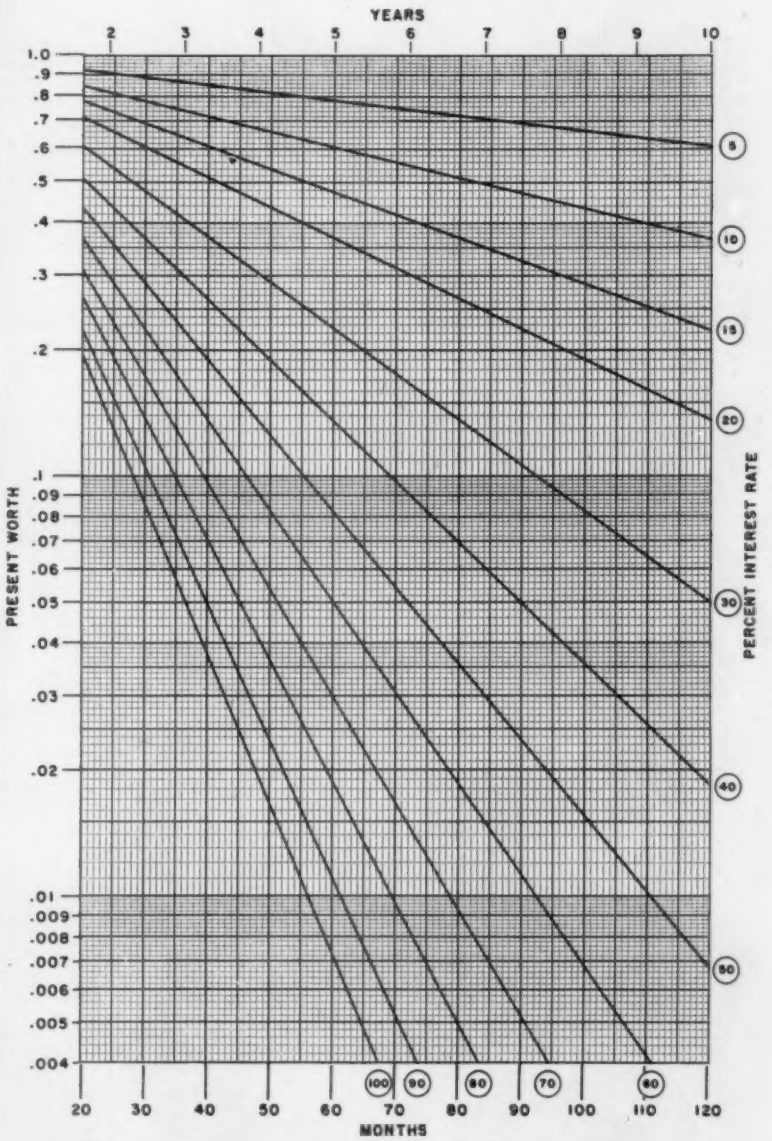
$\times 0.369 = 188{,}400 + 46{,}051 = \mathbf{234{,}451}$

Let $r = 0.30$, $x = 0.30 + 0.223 = 0.523$

$60{,}000 \times 2.59 + 60{,}000 \times 1.77 \times 0.221 = 155{,}400 + 23{,}470 = \mathbf{178{,}870}$

Interpolating:

$$r = 20\% + 10\,\frac{234{,}451 - 200{,}000}{234{,}451 - 178{,}870} = \mathbf{26.2\%}$$



SINGLE-PAYMENT present-worth factors, continuous compounding. Fig. 5.

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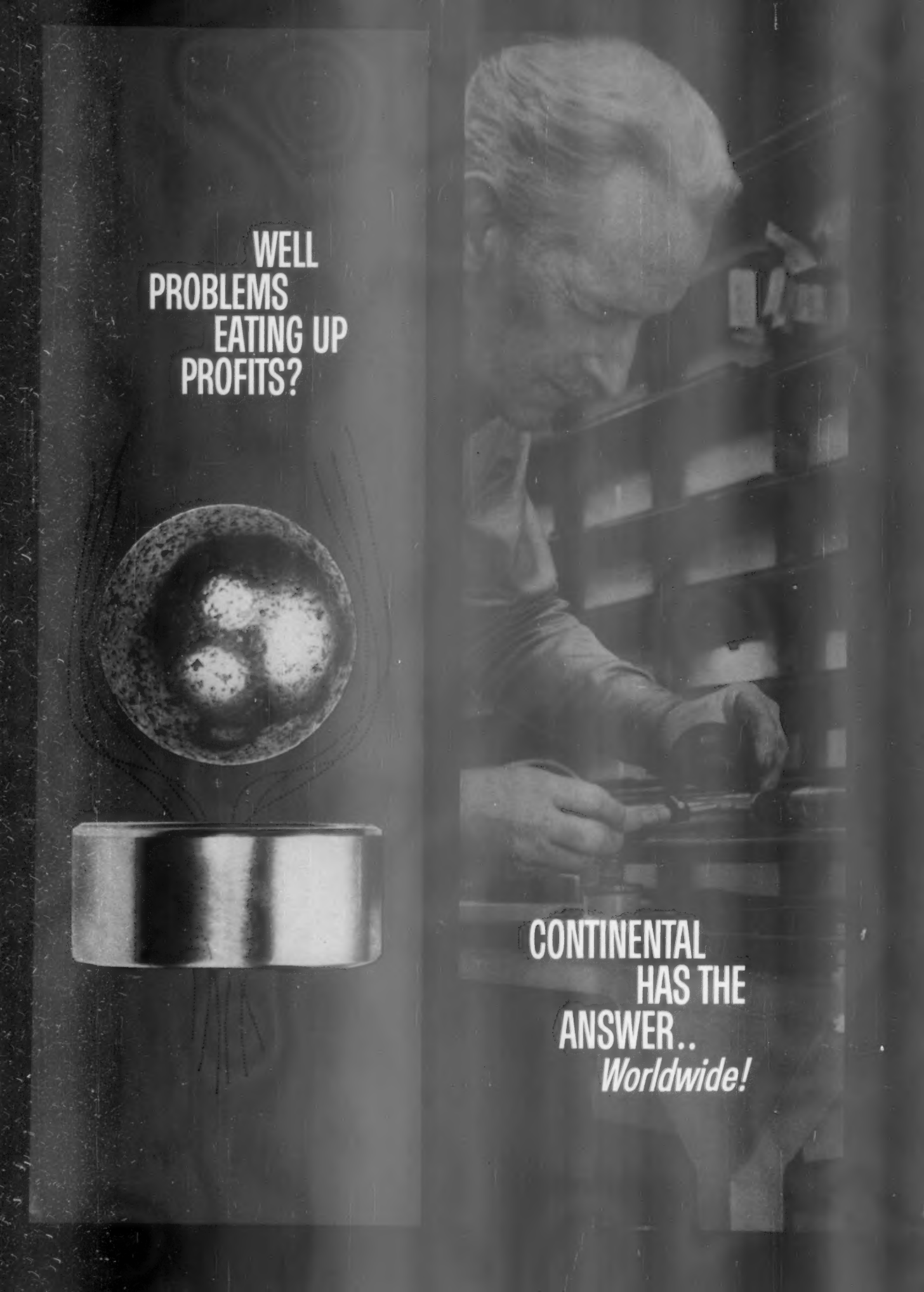
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P11-81

It is worth noting that the rate of return for this project is virtually the same for annual and continuous compounding.

In this example, the forecast was considered to be net income. Sometimes it is preferable to forecast gross income with operating costs remaining constant throughout. This is accomplished by subtracting the present worth of operating costs. In the example above, if the forecast is in gross income and operating costs are C_o per year, then the rate of return would be determined by:

$$E_1 (PW_{n1r}) + \frac{E_6}{D} (PW_{n2x}) \frac{1}{(1+r)^{n1}} - C_o [PW_{(n1+n2)r}] = C$$

Since records of oil and gas income are normally maintained on a monthly basis, the use of monthly compounding of interest would be the most realistic. However, continuous compounding will give nearly identical results, and annual compounding will give similar answers within certain ranges of interest and project life. A glance at the present-worth Equations 11 and 12 reveals that as n increases, the present-worth factor approaches the limiting value 1/r regardless of the compounding periods used.

The following tabulations illustrate the effect of time and interest rate on the actual values of equal-series present-worth factors for various compounding periods:

n = 5 years

Interest rate %	Present-worth factors for different compounding periods: Annual	Monthly	Continuous
10	3.79	3.92	3.93
20	2.99	3.14	3.16
40	2.04	2.15	2.16
60	1.51	1.58	1.58

n = 10 years

Interest rate %	Present-worth factors for different compounding periods: Annual	Monthly	Continuous
10	6.14	6.31	6.32
20	4.19	4.31	4.32
40	2.41	2.45	2.45
60	1.65	1.66	1.66

n = 20 years

Interest rate %	Present-worth factors for different compounding periods: Annual	Monthly	Continuous
10	8.51	8.64	8.65
20	4.87	4.90	4.91
40	2.50	2.50	2.50
60	1.67	1.67	1.67

1. For greatest accuracy in determining rate of return of oil and gas income, either monthly or continuous compounding of interest should be employed.

2. The use of annual compounding will result in conservative rates of return for rates less than about 20%, for project lives of 10 years or less, and for forecasts consisting of declining income only.

3. Any economic forecast must always contain an element of judgment or even pure guesswork. It hardly seems justifiable, then, to demand precise calculations of rates of return for estimated future incomes. Because of the approximate nature of economic forecasting, rates of return calculated with annual compounding factors are sufficiently accurate.

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BY W. L. NELSON, Technical Editor and Petroleum Consultant

Questions on TECHNOLOGY

More on obsolescence costs

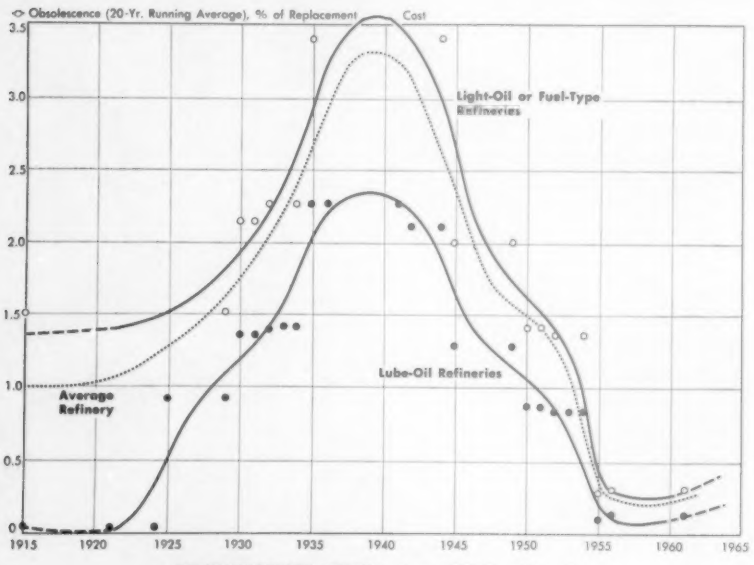
Although your article on Cost of Refinery Obsolescence was most interesting, we still do not know what to use for obsolescence cost. Could you suggest more specific figures? G.H.T.

Process Costimating No. 92 was in fact incomplete. Accordingly, Fig. 1 shows the 20-year running average of the obsolescence costs derived in Process Costimating No. 92 (April 17, 1961, p. 113).

Although obsolescence costs for lubricating-oil refineries appear to be lower than for fuel-type refineries, the very great cost of lube plants should not be overlooked. Thus, the lube-refinery peak of about 2.3% required an expenditure for obsolescence of about $12 per daily barrel (each year), the corresponding peak for fuel-type refineries cost only about $9.50 per daily barrel.

The obsolescence costs shown here should not be confused with amortization, depreciation, additions for quality or efficiency improvement, or the cost of capacity increases. It applies purely to the cost of equipment that must be relegated to the junk yard because it performs an obsolete process.

Nothing now in prospect is expected to greatly increase obsolescence costs. Alkylation plants were rapidly replacing polymerization plants during 1959 and 1960, but the polymerization plants are generally old and parts of them can be used in other processes. Thus little obsolescence cost has recently been occurring.



OBSOLESCENCE COSTS since 1915. Fig. 1.

What is pressure near end of open pipe?

Would you advise me if any reliable data are available to calculate the static pressure near the end of an open line when a quantity of gas of known free volume, specific gravity, and temperature are discharged into the atmosphere?. F. G. D. M.

The relationships suggested by B. F. Dodge in his book entitled "Chemical Engineering Thermodynamics" (McGraw-Hill Book Co., Inc., N. Y., 1944) are thought to be reliable. On Page 351 he derives the following equation which pertains to the maximum rate of flow that will be attained:

$$(p_1/p_c)^2 = 1 + \ln (p_1/p_c)^2 + \frac{4fL}{D}$$

For a high-velocity case (the one normally expected), f is equal to about 0.004. This can be solved by trial and error for p_c, the pressure at the pipe exit which will be greater than the pressure of the space into which the pipe is discharging.

The meanings of the symbols are:

p_1 = upstream pressure, lb./sq. ft. abs.
p_c = pressure very near the outlet, lb./sq. ft. abs.
L = length, ft.
D = diameter of pipe, ft.

With this value of p_c, the maximum flow can be calculated from:

$$G^2_{max} = \frac{(p_1^2 - p_c^2)\, g\, M}{2RT\,[\ln p_1/p_c + (2fL/D)]}$$

Where:
g = acceleration of gravity, 32.2
M = molecular weight of gas
R = gas content, 1,544
T = temperature, °F. abs. (°R.)
G = mass velocity, lb./sec./sq. ft.

What is batch coking?

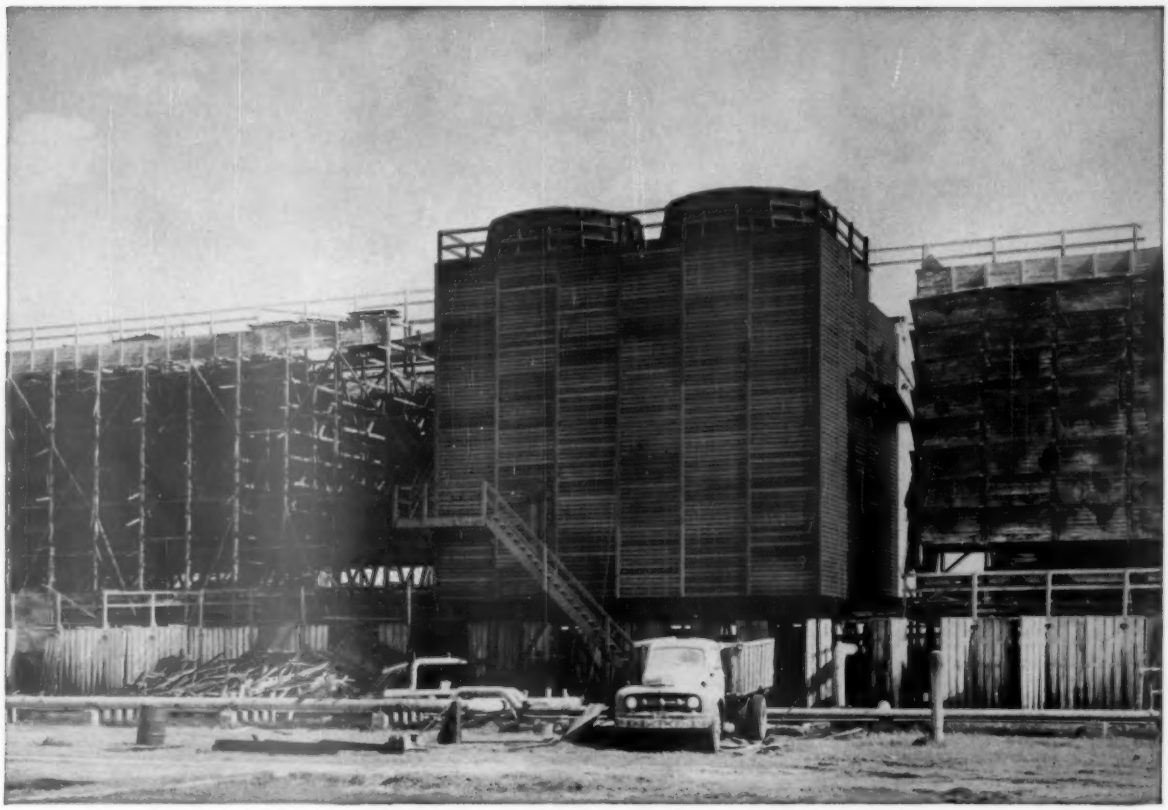
In your excellent refining number of April 3, 1961, p. 165, coking processes are listed as fluid, delayed, and batch coking. What is the batch coking and isn't there another type, namely catalyst coking? Also can you direct me to a listing of coking plants outside the United States and Canada? W. J. K.

The earliest practice of coking was accomplished in thick-shell horizontal batch stills, and according to the reports shown in The Oil and Gas Journal of April 3, 1961, some refiners still feel that they are conducting such an operation. Batch or shell-still coking can result in superior hardness coke, and the operation is somewhat similar to the oven-type coking operations (Knowles, etc.) used in a few plants to produce specialty cokes.

Later coking was conducted as a part (usually not desired) of the operation of the reaction chamber thermal (Dubbs, Cross, etc.) cracking processes, and in 1926-1932 these operations were modified into what we now call delayed coking even though the name delayed coking was not devised until several years later.

Catalytic cracking as a classification of coking processes is not known to this department.

Data on the processing conducted in foreign refineries are so incomplete that we are unable to suggest a list of coking plants throughout the world. Fuel oil is relatively valuable throughout most of the world and hence one would expect little interest in coking.



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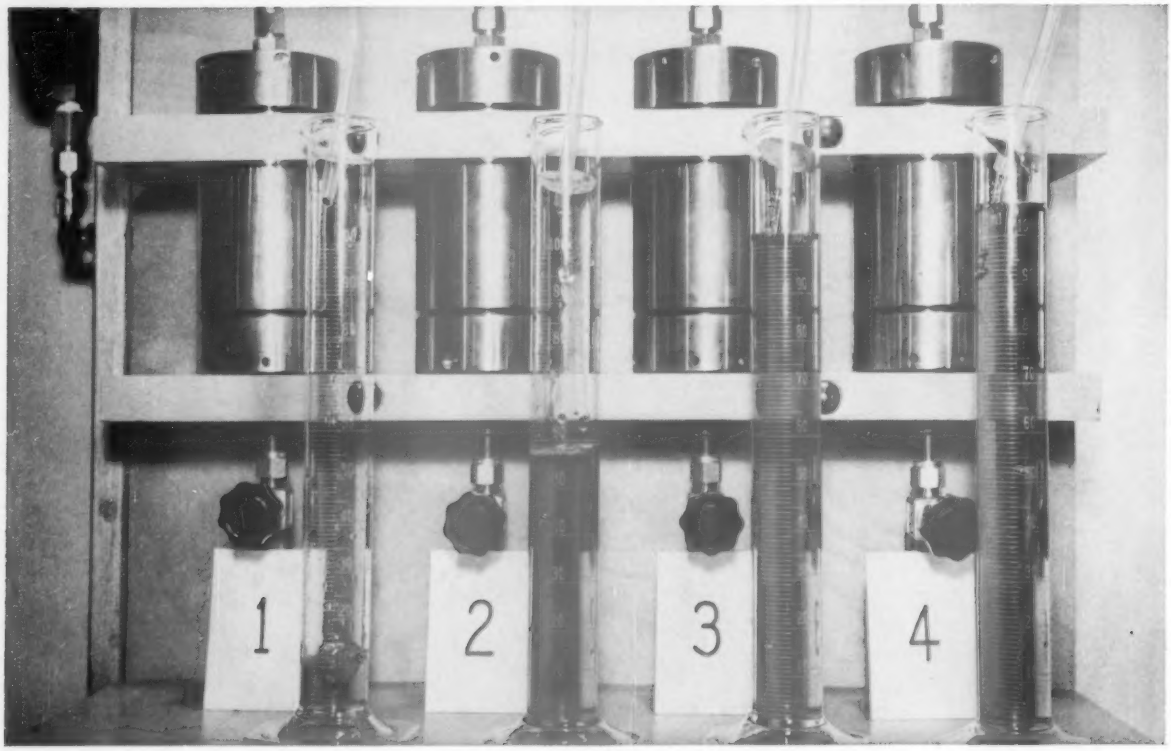

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39. How to find ultimate recovery and performance of oil reservoirs

BY E. T. GUERRERO

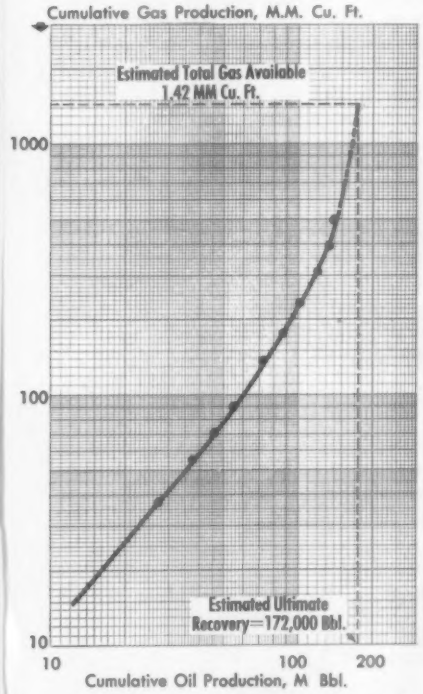
GIVEN: (1) Range of ultimate oil recoveries by type of drive, Table 1; (2) cumulative gas production vs. cumulative oil production for Bankline-Owen field in Texas, Fig. 1; (3) percentage of oil in total fluid produced vs. cumulative oil production for Calvin field in Illinois, Fig. 2; and (4) oil-water contact vs. cumulative oil production for lease in East Texas field, Fig. 3.

FIND: Use given data to estimate ultimate oil recovery by four empirical approaches.

SOLUTION: Table 1 shows ultimate recoveries by type of drive. The ranges and average values apply to most pools and are based on observed performances.[1 2 3] However, exceptions to these values can be found. Figs. 1, 2, and 3 show three correlations which can be used to find remaining reserves and ultimate recovery. Fig. 1 relates cumulative oil and gas recoveries on a log-log plot. Extrapolation of the general trend to total gas available gives an ultimate oil recovery of 172,000 bbl. in this example.

TABLE 1—RANGE OF ULTIMATE OIL RECOVERIES BY TYPE OF DRIVE

Type of drive—	Ultimate oil recoveries, per cent of initial in place: Range	Average
Liquid and rock expansion	2- 5	3
Solution gas	12-25	18
Gas cap	20-40	30
Edge water	35-60	45
Bottom water	20-40	30
Gravity	50-70	60



CUMULATIVE PRODUCTION DATA, both oil and gas, can be extrapolated to total available gas to estimate ultimate oil recovery. (After Arps[1].) Courtesy AIME. Fig. 1.

Fig. 2 shows a correlation of cumulative oil recovery with percentage of oil in total fluid produced on a semilog plot. Extrapolation of the trend to the abandonment water cut gives an estimated ultimate oil recovery of 342,000 bbl. for this field. Such a correlation is applicable to water drive or water-flood pools.

For an edge or bottom-water drive a correlation such as shown in Fig. 3 can often be used. Here cumulative oil recovery is related to elevation of oil-water contact. Extrapolation of the trend to the average top of the sand gives the ultimate oil recovery which, for the lease shown, is 216,000 bbl.

DISCUSSION:

Two previous problems[4 5] illustrated the use of production-decline curves, which are empirical methods. This problem illustrates four additional empirical methods.

If the initial oil in place and principal type of drive for a pool are known, then the data of Table 1 can be used as a guide to estimate ultimate oil recovery. They are based on observed and recorded performances.[1 2 3] Exceptions can be found, and the ranges and averages shown may change in future applications.

For example, the recovery by liquid and rock expansion depends largely on the amount of undersaturation involved. This is tending to increase as deeper and deeper pools are discovered.

A notable exception to the values shown for liquid and rock expansion is that reported by E. V. Watts[6] for the D-7 zone in Ventura Avenue field where 40% of the initial oil in place was recovered. It may be possible in this case that gravity drainage assisted the liquid and rock expansion process.

Normally the driving mechanism in a pool involves several types of drive. Certainly fluid separation or gravity drainage is present in every case to a varying degree. Gas-cap and/or water drives may also augment solution-gas drives. Although all pools have combination drives, it is not uncommon to observe that one of the types of drives will be predominant. Under such conditions pools are referred to as having a single type of drive. This assumption is valid since the contribution from the other types is insignificant by comparison. Also, some of the ranges shown in Table 1 are influenced by combination drives. This is particularly true of the solution-gas and gas-cap drive ranges. The upper end of each of these ranges is believed to include some assistance from gravity drainage. The lower end of the ranges for these two types of drives may be due to poor sand conditions, thin oil sands, improper production practices, and other causes.

Efficiency obtained from an edge-water drive depends to a large extent on the uniformity of the formation and the size of the pool. Excessive nonuniformity leads to fingering of the water, bypassing of oil, and the production of large quantities of water along with the oil. In the larger pools a better sweep efficiency is obtained. Gravity is less of a factor here than in the case of the gas drive. This is due to the fact that oil and water do not differ appreciably in density.

A bottom-water drive is often less efficient in oil displacement than

Better Production Tools Through Research

OTIS Equipment NEWS

Volume III, Number 4 Otis Engineering Corporation • Dallas *Production Equipment and Services*

New Low Pressure Pilot System Offers Simplified Multi-Point Protection In Surface Safety Valve Installations

DALLAS—Two new Otis Pilots have been developed that make possible a well safety system that includes: (1) Multi-point protection utilizing a low pressure control line and (2) Single point, single step resetting to place the entire system back in service after a shut-in. The two new pilots are the Type N Otis Actuator Pilot and the Type P Otis Hi-Lo Auto-Reset Pilot. Both can be used with any one of several different Otis Surface Safety Valves.

A Type N and P Otis Pilot System, when combined with the proper Otis Surface Safety Valves, may be installed to protect a single well or a number of wells such as may be located on an offshore platform. The simplest installation is where a low pressure line connects the Type P Pilots at the point where protection is desired and the Type N Pilot on the safety valve. With this type of hook-up pressure changes from the flow line, sales line, heaters, separators, etc. are automatically transmitted from the Type P pilot to the Type N Pilot and Safety Valve.

Evidence of the acceptability of the new Type N and P Otis Low Pressure Pilot System within the various levels of field operating personnel, from superintendents and engineers through pumpers and gaugers, is indicated by the large number of installations made during the short time the equipment has been available.

Application

The application of the Type N and P Otis Pilot System is practically unlimited — from a single well, simple line pressure installation to a complex, multiple well installation that requires a number of protection points for various conditions that could cause serious loss.

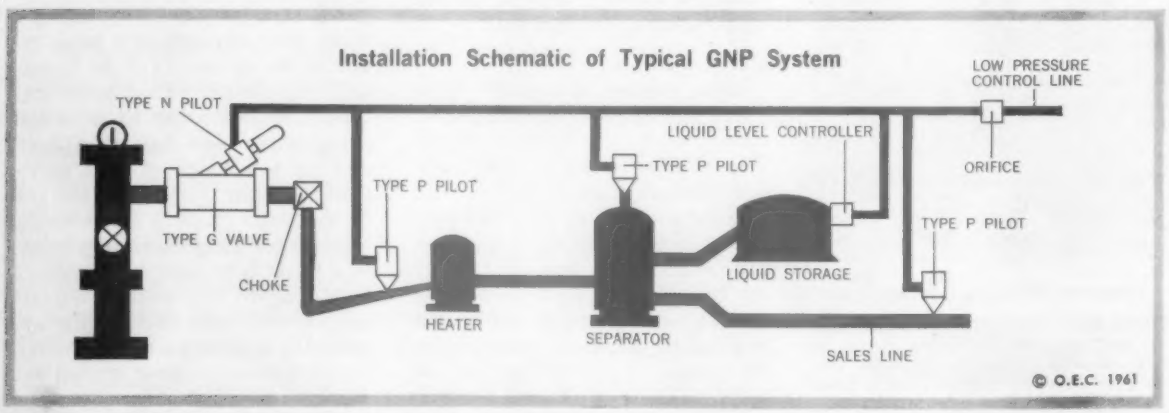
Basically the Type N and P Otis Low Pressure Pilot System is designed to monitor pressure increases or decreases at such points in a surface safety installation as line pressure, separator, LTX unit, free water knockout, heat exchanger and other field processing or production equipment. The system may be installed to monitor various other conditions, also, such as liquid levels, high or low temperatures, volume, viscosity, etc. Electrical control of the system — radio, direct wire or microwave — can be added through the use of solenoids and other electrical equipment. A typical installation, in schematic form, is below.

Here are several of the System's Feature Design Principles —

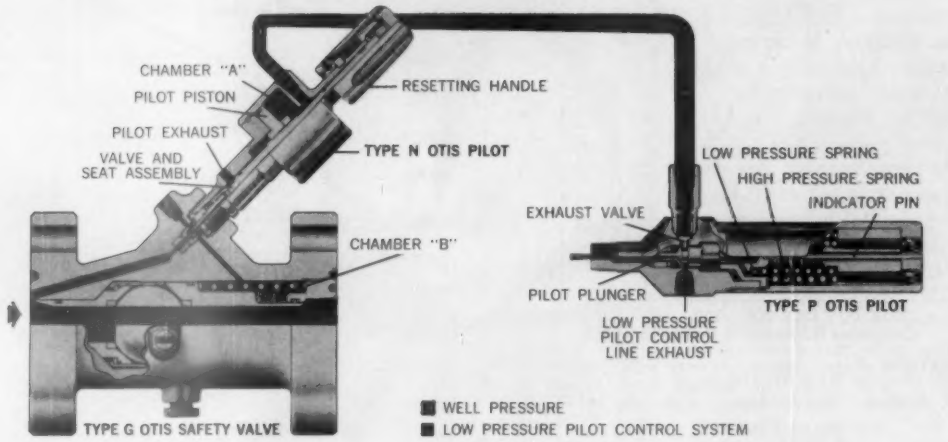
Low Pressure Control Line

The Type N and P Otis Safety System is designed around the use of a low pressure (usually 30-60 p.s.i.) control line that connects the Type P Monitor Pilots with the Type N Actuator Pilot attached to the safety valve. The use of the low pressure line all but eliminates the possibility of hydrates forming and freezing the line — increasing the reliability of the safety installation. When a shut-in occurs, only one high pressure exhaust takes place . . at the safety valve. Choice of source pressure for the control line is optional — pressure is usually taken from the separator or furnished by bottled gas.

The system, in simplified form, monitors pressure changes through the Type P Otis Hi-Lo Auto-Reset Pilot. Pressure fluctuations beyond the preset limitation of the Type P Pilot cause the pressure on the control line to exhaust. Upon exhaust of the control line pressure, the pressure behind the piston of the Type N Otis Actuator Pilot is removed, allowing the pilot to exhaust a pressure chamber in the safety valve. This action serves to create a pressure differential in the safety valve and permits the line pressure to close the valve.



Operating Design Principle of Type GNP System



Illustrated as an example of a Type N and P Safety System is the Otis Type G Valve combined with the Type N and P Pilots. This combination of Otis equipment constitutes a safety system suitable for sensing pressure changes from a wide range of remote points. Although the Type G Otis Surface Safety Valve is used for illustration, the pilots may be used with other Otis Surface Safety Valves.

The Type P Pilot serves to monitor pressure fluctuations (within predetermined limits) in the flow line and/or other lines. Pressure variations, either too high or too low, cause the exhaust valve in the Type P Pilot to unseat and release the constant pressure on the connecting low pressure control line. When pressure is released from the control line, the low pressure on top of the piston in the Type N Pilot (Chamber A) is released and the piston moves back, allowing a ball to seat in the bypass of the Type G Valve. With the bypass sealed, pressure from Chamber B in the safety valve is exhausted through the pilot, creating a pressure differential across the ball and flow line pressure may then rotate the ball to the closed position. The entire system may be reopened merely by turning the resetting handle on the Type N Otis Pilot since the Type P Otis Pilot is designed to reopen automatically when pressures return to normal.

Single Point, One Step Reopening

The entire Type N and P Otis Pilot System is designed to be placed back in service after a shut-in by resetting the Type N Otis Pilot on the safety valve. The operation of the system is controlled from this one point . . there are no complicated procedures or detailed resetting instructions to follow. Merely turn the resetting handle on the pilot in as far as it will go and then back it out. The Type N Pilot also may be used to lock a safety valve installation out-of-service with the safety valve in the open position.

Design Principles of The Type N and P Otis Pilots

The adaptability of the Type N and P Low Pressure Pilot System comes from the flexible design principles incorporated into the two pilots . . Type N Otis Actuator Pilot and Type P Otis Hi-Lo Auto-Reset Pilot. As the name implies, the Type N is an actuator pilot for use on Otis Surface Safety Valves. The pilot does not monitor pressure changes, but acts only as a means for closing and opening the safety valve.

Well pressure is exposed to only a small portion of the pilot's valve plunger area. The internal springs, piston and other working parts of the pilot are normally never exposed to well fluids.

The standard Type N Pilot requires manual resetting. It may be modified for automatic resetting. The Type N Pilot is regularly supplied in a 150:1 operating ratio and installation records show a minimum of maintenance.

Type P Otis Hi-Lo Auto-Reset Pilot is a combination high and low pressure sensing device (0 to 10,000 p.s.i. range). It may be installed at any point in a surface safety valve system where protection is desired. The Type P Pilot does not require manual resetting after a shut-in but is designed to reset itself when the pressure it is monitoring moves back into the range of its settings.

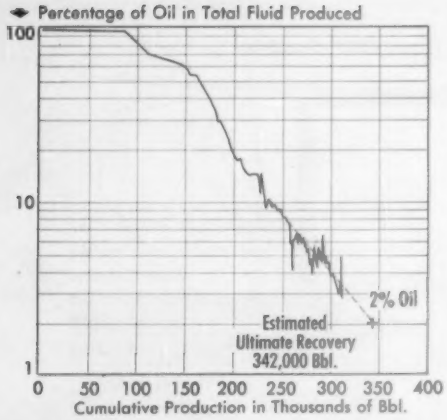
A small pin at the rear of the pilot indicates whether the pilot is set and "in-service" or whether it has operated. Pressure from the monitored source enters in only a small portion of the ½" threaded male connection. Fluids that could corrode or damage the internal working assembly do not enter the main body area of the pilot.

For more details on the construction and operation of the pilot, see illustrations above.

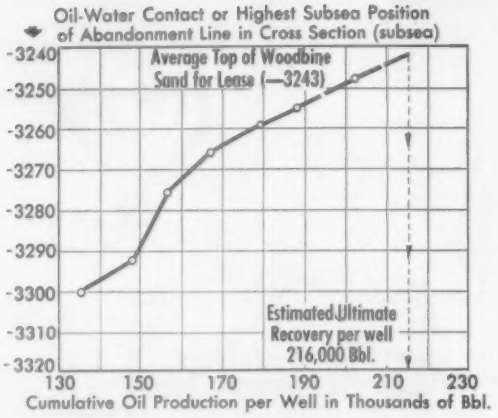
Safety Equipment Recommendations

The Type N and P Otis Pilots are excellent examples of Otis' leadership in safety equipment. Experienced and trained Otis Safety Equipment Specialists have the combined knowledge of the company's more than 20 years experience to draw on when making installation recommendations. Whatever your safety equipment requirements, call the Otis office nearest you or write Otis, Dept. E-4, P. O. Box 35206, Dallas 35, Texas. You'll find Otis Safety Valve Specialists ready to help you . . anxious to serve you . . with the widest variety of production equipment and services available today.

OTIS



VARIATION of cumulative recovery with fraction of oil in total fluid, Tar Springs sand, Calvin field, Illinois. (After Arps[1].) Courtesy AIME. Fig. 2.



VARIATION of cumulative recovery with advancement of oil-water contact, East Texas field (After Arps[1].) Courtesy AIME. Fig. 3.

the edgewater drive. Bottom-water drive needs adequate vertical permeability. This permits the water to rise vertically and displace the oil to the producing wells. Involved in this process is the problem of water coning. This is more severe in thin formations than in the thicker formations, and explains to some degree the range in recoveries obtained. For a thin oil column of 10 to 15-ft. thickness the 20% value might even be high. In this case production rate would also have an effect on the recovery obtained. A low production rate would tend to minimize the coning problem and would afford time for gravity to assist the recovery process.

Gravity drainage shows the highest ultimate oil recovery. This type of drive requires a dip of 10° or more and a permeability of 50 md. or greater. Recovery from this type of reservoir is rate sensitive. Therefore, the rate of production must be controlled to minimize pressure gradients in order to permit the differences in densities between the oil and gas to create a condition where the oil flows down and the gas flows up.

Pressure gradients created in the upper portions of the structure tend to eliminate the gravity effects. This type of drive seems to work best after the pressure in a pool has been depleted. It tends to be very slow and the higher recoveries are obtained from the larger pools where enough drainage occurs to make the operation economical.

It is well to point out again that the ranges and averages shown in Table 1 are based on past observations. They will probably decrease to some extent in the future because the fracturing well completion and workover technique has made possible the economical recovery of oil from poor-quality reservoirs. Many pools which could not be produced before because of very low permeabilities can now be exploited.

Figs. 1, 2, and 3 are examples of possible empirical correlations that can be used to estimate remaining reserves. Fig. 1 is based on the assumption that the amount of producible gas to abandonment conditions can be computed. Since gas moves freely through a reservoir it can generally be assumed that at abandonment residual gas will consist of that in solution plus free gas at abandonment pressure. This determination can be made with fair accuracy using volumetric and fluid-property data. Thus the end point to a curve such as that shown in Fig. 1 can be found.[1]

For water-drive fields correlations such as shown in Figs. 2 and 3 are popular. The end point in Fig. 2 is represented by the lowest oil percentage which, combined with a fluid-producing capacity of a lease, will just cover operating expenses. This plot shows a history correlation which can easily be extrapolated to an abandonment water cut of 98%.

In Fig. 3 the depth of the oil-water contact or abandonment contour is selected as the dependent variable and plotted against the cumulative oil recovery as the independent variable. Here the end point is the average depth of the top of the sand. The method of extrapolation is based on the simple assumption that when the abandonment contour progresses to the top of the sand, the lease must be abandoned. In this case also, history gave a correlation that could easily be extrapolated to the end point.[1]

This article presents examples of empirical methods for determining reserves and ultimate oil recovery. When careful judgment is used in their application reliable results can be obtained.

The use of the average values in Table 1 assumes that the type of drive for the pool in question can be defined and that its recovery will be equal to the average of many similar types of pools. The use of correlations such as shown in Figs. 1, 2, and 3 assumes that future performance will be similar to past performance.

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Acknowledgment

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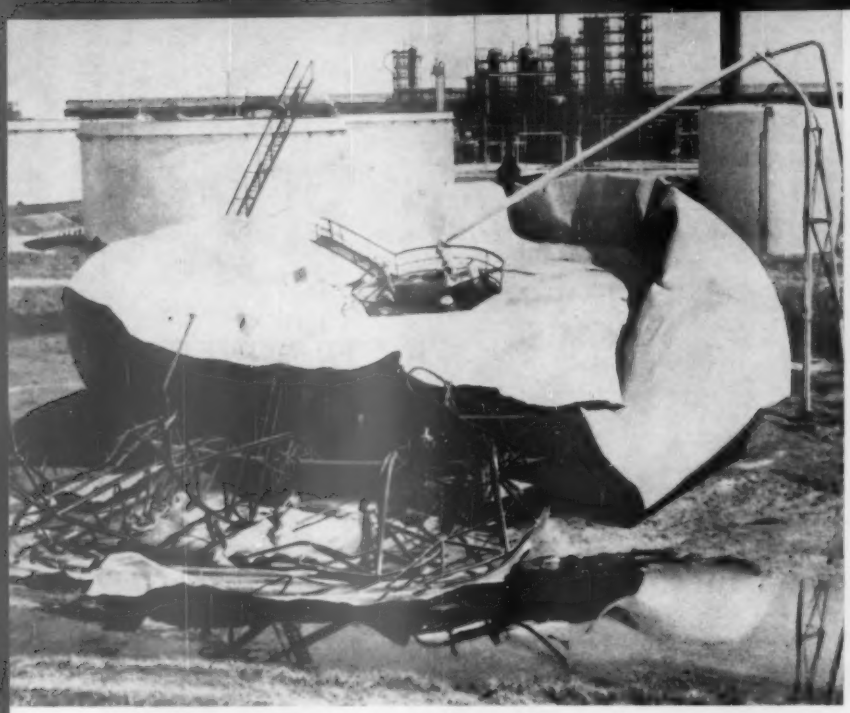


COLLAPSE OF SPHEROID during gas-freeing shows need for constant vigilance. The mishap occurred while removing tank from service for routine cleaning and inspection. The accident was attributed to an internal explosion caused by a remaining gas pocket, air, and iron sulfide as the water used to displace the gas was withdrawn.

Spheres and spheroids are safest tankage, but . . .

. . . unless you follow some common sense safety measures, they'll meet with mishaps, too. Here's a rundown on how to operate them safely.

BY HUBERT T. FULLER AND RALPH E. BISTLINE
Mobil Oil Co., Beaumont, Tex.

THE PETROLEUM INDUSTRY has devoted much time and effort to improving the design of units and unit operating facilities to eliminate hazards. It is important that we devote the same effort to plant offsites.

Mobil Oil Co.'s Beaumont refinery operates and maintains 20 spheres and spheroids totaling 400,000-bbl. capacity.

Over the years, we have developed certain procedures for operating and maintaining these tanks. They are not necessarily original. Most are the generally accepted standard practices used throughout the industry. Some, however, have been adopted directly from published recommendations and plant visitations. Others represent modifications of the combined recommendations to satisfy our own judgments and pocketbook.

Paper presented at API Refining Division meeting, Houston.

Operation

The best of design, with every conceivable safety feature, is for naught unless followed by sound operating practices.

In our refinery, responsibility rests with the oil-movements section of the process department and the pumping foreman and his shift crews. The foreman is a veteran supervisor who runs a rigid shop, and his men respect him for it. His crew chiefs could also be considered veterans as could the next junior man (10 years plus), and each has grown up with a healthy respect for the type of products and tankage he is responsible for handling.

Additionally, there is a special pumper assigned to the day shift only. His primary responsibility is the safe preparation of lines, pumps, and tanks for maintenance or other purposes; the following of the work itself; and the placement of the equipment back in service in a safe and orderly manner.

Like most companies, we gas-free by water displacement, then reverse the procedure (with the use of natural gas) when placing the vessel back in service.

When maximum filling capacity for water is less than total capacity, water is used to the maximum limit and nitrogen purges the hydrocarbons in the remaining vapor space. Our experience indicates that approximately 2 volume changes of nitrogen are required to displace the hydrocarbon. On the reverse operation, 1 to 1½ volumes of nitrogen are required to displace the oxygen.

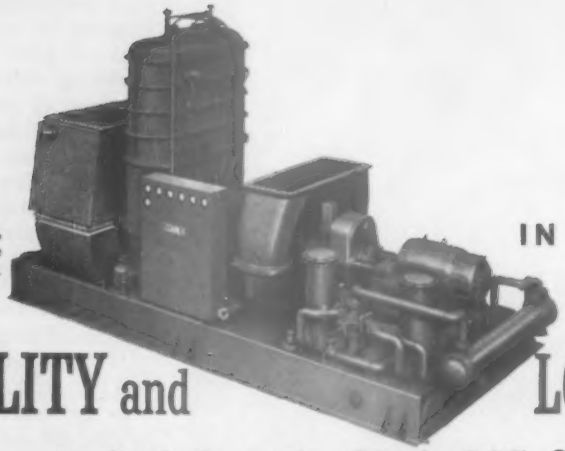
All communications are channeled through the crew chief at a zone-headquarters control station. This field office contains a remote-gaging instrument for all tanks, and recorders for telemetered flows and pressures on outside pipeline movements into or out of the tankage. Additionally, a 2-hour checkout system is used for all outside pipeline deliveries and receipts.

Operating-unit meters are used for all process streams entering or leaving the tankage; thus close liaison is required between the oil-movements crew chief and the unit operator.

Through oil-movements section is responsible for all offsites, the unit operator is responsibile for the unit stream, and each is responsible to the other for advising of irregularities.

As a further check on the remote-gaging instrument, each active tank is gaged every 4 hours at the site by the field pumper. As each 4-hour gage is taken, the gage is checked manually to ascertain its working condition. The site gage is recorded in the pumper's gage book and then called in to the crew chief for checkout.

Tanks are removed from active

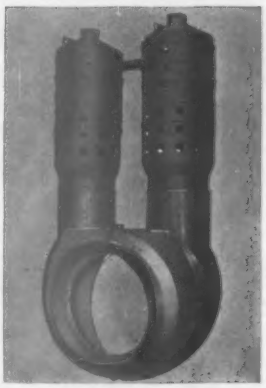


Clark Model 305-S, single shaft gas turbine rated at 9000 hp.

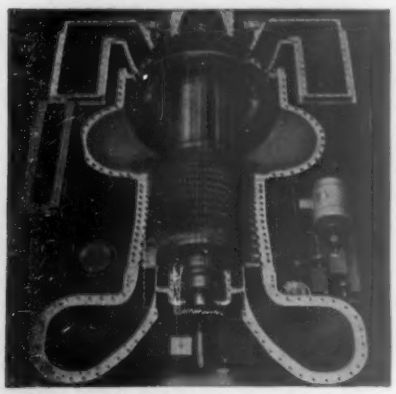
IN GAS TURBINES YOU LOOK FOR RELIABILITY and LOW FIRST COST

Here's why you'll find them in Clark 305 Series Gas Turbines

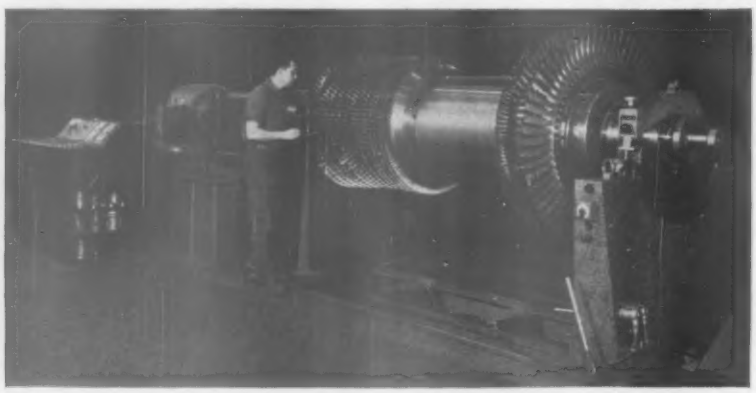
- **Heavy Duty Industrial Design**—Simple, open cycle machines, built for continuous, full load operation . . . ideal drivers for compressors, generators and pumps.
- **Single Shaft Construction**—Provides high rotating inertia and minimum speed variations under transient load conditions. Two-Shaft units available for applications requiring wider operating flexibility.
- **Design Simplicity**—Integral compressor-turbine rotor is supported by two readily accessible journal bearings. Entire unit including combustion system is contained in common casing structure.
- **1400°F Operating Temperatures**—Insure long life of hot parts plus substantial margin of safety.
- **Air Cooled**—Pressurized air cools high temperature components . . . air envelopes minimize heat loss and operating temperatures wherever possible.
- **Vertical Combustion Chamber**—Prevents direct flame impingement on turbine blading . . . assures more uniform heat distribution.
- **Horizontally Split Casing**—Upper half can be removed in one piece to remove rotor . . . inspections quickly made using light lifting equipment.
- **Renewable Labyrinth Seals**—Of honeycomb construction . . . minimize leakage at all close clearance points on turbine shaft.
- **Proved Reliability**—Materials of construction and important components such as turbine blade root design, turbine discs, journal bearings and axial compressor based on broad Clark experience in building heavy duty gas turbines.



Unitized combustion chamber with two parallel burners, each enclosed in a liner of high temperature nickel chrome alloy.



Single rotor is supported by two journal bearings for greatest simplicity. Horizontally split housing provides easy accessibility.



Rotor is statically and dynamically balanced for optimum performance. Turbine blades are of high temperature forged steel. Air streams cool turbine blade roots and both sides of discs.

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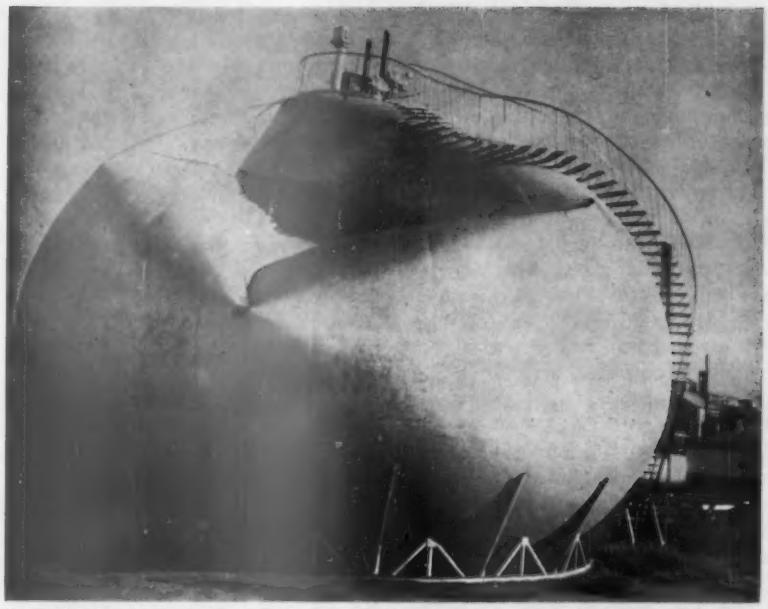


VACUUM VENT FAILURE probably caused this accident. The vessel ruptured while product was being transferred from it. The relief vacuum vents, installed without block valves, had never been removed for shop inspection.

service as soon as possible after the discovery of a faulty gaging device. During any such interim, the vessels' tricocks are used for gaging at 2-hour intervals, and the tank level is maintained between a range of 40 to 60%.

Sphere pressures and temperatures are noted at each gaging period and are recorded along with the corresponding gage at 8-hour intervals.

Except for an unusual circumstance, accumulated water is drawn from the tanks during the day shift only. Each active tank is checked daily by the responsible pumper and, in most cases, the special pumper is also in attendance as an added precaution against mishap.

Double blocks are provided for all water draws. One is located at the tank nozzle and the other several feet downstream for control. Both are closed except when drawing water, and the tank valve is closed first to permit emptying of the drain line after each water-draw operation.

Thunderstorms are a menace in the Gulf Coast area. The crew chief is responsible for seeing that pumpers apply steam to all safety valve vents as storms approach and that steam is cut off after the storm passes. Should lightning cause one to go afire and additional steam be inadequate for control, a dry-chemical extinguisher is used for snuffing. A hand extinguisher is available inside each tank levee.

All relief valves vent to the atmosphere, with the open end extended upward to a minimum of 7 ft. above the tank shell. A small weep hole near the bottom prevents the vertical extension from filling with water or hydrocarbon.

Fixed water sprays have been installed atop all tanks as protection against radiant heat from any nearby fire. Sprays are tested once each month by the special pumper and a record is maintained of each test date.

Testing generally is done during rainy weather to prevent staining of the paint on the tank shells. Water valves are located near the tank levee and are controlled on an individual basis. Pressure is furnished directly from the main fire-water-line system. A nearby LPG-products-pipeline pump station (open air) is similarly equipped.

Gas-Freeing, Inspection, and Testing

As with process units, a work schedule is prepared for each vessel each time it is taken out of service. The work schedule contains a detailed procedure for gas-freeing, inspecting, and testing.

The program is developed and confirmed by representatives from process, maintenance, engineering, and safety, and each group assumes its share of the responsibility as the work progresses.

Complete water displacement and hydrostatic testing are used wherever possible for gas-freeing. This method is suitable for all of our spheres and for all but two of our spheroids. For the two whose maximum fill capacities are less than total capacities, a combination of water and nitrogen is used for gas-freeing. Because this type of vessel is the most hazardous to handle, here is a description of the procedure used for gas-freeing, inspecting, and testing it.

The vessel is a 100,000-bbl. noded spheroid built during 1936 for the storage of light gasolines. The tank was designed for 15-psig. maximum pressure and a 40-ft. maximum filling height.

Corrosion has forced a reduction in both allowable pressure (10 psig.) and liquid capacity (35½-ft. maximum filling height). As a result, the vapor space above the maximum filling capacity has been increased from about 70,000 to 118,000 cu. ft.

Gas-freeing

1. Empty product on main suction line to minimum level.
2. Blind the 10-in. product filling line at the flange nearest the tank valve.
3. Connect a temporary 6-in. water-filling line from the fire line to the nearest tank drawoff. Connect a 2-in. steam-supply line (125 psig.) into the water line with a check valve in both lines. Locate all valving outside of the tank levee.
4. Establish a 3-ft. water bottom in the tank, then pump out to the minimum suction level.
5. Repeat Item 4 until discharge water is completely free of oil.
6. Blind the 12-in. suction line at its main tank valve.
7. Check block valves under relief valves to verify that they are open.
8. Attach recording pressure gage at connection near bottom of tank, and run a pressure connection from this same point across the tank levee to the manifold being used for filling the tank with water. Install a recently checked pressure gage (0-30-psi. range) on this connection (this provides an added precaution in preventing overfilling).

9. Install steam ejector on end of pressure gage line. (The line originates at the pressure tap on top of the vessel, runs down the side of the tank, and terminates near the foot of the stairway.)

10. Remove blind flange from valve on 6-in. nozzle on top of vessel, install flame arrestor, and open valve.

11. Fill tank to a gage reading of 35½ ft. of water (vessel is equipped with ground-level remote-reading level gages). Temperature of filling water should be between 105° and 107° F. to maintain a minimum water temperature in the tank of 100° F. The water is heated by means of the steam heater in the supply line. The warm water aids in the hydrocarbon-vapor removal. Filling rate is approximately 10,000 bbl. per day.

12. Install nitrogen line from manifold outside the levee to the five water-drawoff nozzles at the bottom of the tank and begin injection of nitrogen at low rate through all five nozzles. This provides some distribution and agitation. Nitrogen is delivered in trailers and connected at manifold (two trailer sizes are available—24,000 and 41,000 cu. ft.).

13. Take frequent bomb samples through the top pressure-gage connection (sample bomb is connected upstream of ejector which is used to pull a sample into the bomb), and continue purging with nitrogen until the gas analysis shows that the tank is in a safe condition. (Gas samples are analyzed in the gas laboratory and purging is continued until nitrogen content reaches a minimum of 90 vol. %.) Purging is done during the day shift and on week days only.

14. Remove flame arrestor and install a fire hose equipped with a fog nozzle, down through the tank nozzle.

15. Open the top manhole and install a steam syphon air remover on the manhole. Make sure that the syphon is securely grounded. Do not start exhausting the tank at this point.

16. Open water supply to the fog nozzle and begin draining water from the tank. Leave this nozzle in continuous operation.

17. When water has been drained down below the bottom manhole, open this manhole, put stream syphon in operation to exhaust tank, and finish draining water from tank.

18. As soon as possible, begin washing manually with fire hoses through the manhole opening.

19. Make periodic safety checks on gas within tank. As soon as it is safe, move personnel into tank and wash walls thoroughly with fire hose (continue safety checks.) It may be necessary to manually scrape scale from internals and the interior of the vessel wall in order to make the vessel completely safe.

Inspection

The maximum interval between inspections is 3 years. Any operation continued for a longer period is permitted only after approval of the engineering department.

Applicable chapters of the API Guide for Inspection of Refinery Equipment serve as an excellent reference in making detailed inspection plans for a vessel.

Thickness measurements are usually obtained by Penetron, Audigage, and Vidigage. To obtain reliable corrosion rates, readings should be accurately located so that the same spots can be read at the next inspection. However, if readings indicate a change in corrosion rate or location, additional measurements would be taken even to the extent of several on each plate.

Corrosion rates are plotted for each course of the tank. These curves are used to predict remaining useful life, to pinpoint the course of plates which experience the most severe corrosion, to determine the allowable operating conditions for the next interval of service, and the length of operation.

Testing

After all work is completed, the tank is tested in accordance with this procedure:

1. All tests shall be conducted using yard air to pressure the vessel. The air inlet is to be connected above the top capacity line.

2. Relief valves shall be installed in the air-pressuring line and set at 6 psig. In addition, an instrument control valve (preset to close at 4 psig.) shall be installed.

3. The pressure recorder attached to pressure-gage connection near bottom of tank for gas-freeing is to be reused.

4. Make sure that all lines connected to the tank are blinded.

5. Samples of the vapors shall be taken to determine if the vessel is in a safe condition before proceeding with the test.

6. Apply 4-psig. air pressure to the empty vessel and check the outside skirt for any uplift. If any uplift occurs, additional sand shall be packed beneath the girder and outer bottom plates. Additional openings, required for packing sand under the bottom, will be cut and repaired where necessary.

7. Open venting nozzles on top of vessel before starting filling operation.

8. Fill the spheroid with water to a gage height of 35½ ft.

9. Samples of vapors above the water shall be taken to determine if the vessel is safe before proceeding with the test.

10. Block or blind all nozzles, including relief valves and vacuum vents, except where pressure recorder is attached.

11. Test the vessel at 12.5 psig. with yard air above the water and hold for 1 hour. During the overload test, all persons shall remain outside the tank levee.

12. Bleed down to a full-load test pressure of 10 psig. Inspect the tank and thoroughly tighten any leaking flanges at this time.

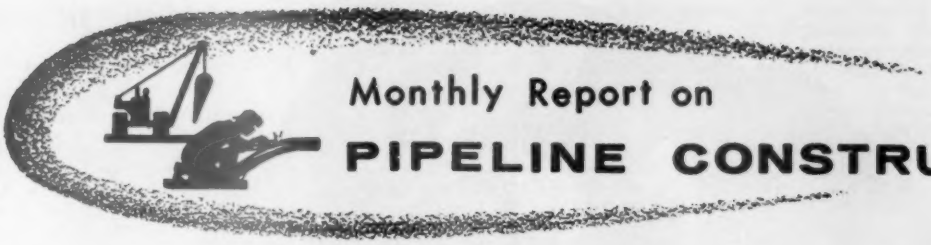
13. Lower the pressure, open the block valves below the relief valves, and build the pressure back up to 10 psig. This operation is to test the relief valves.

14. After test is complete, bleed off pressure and attach nitrogen source to the water-drawoff nozzle at the bottom of the tank. Begin injection of nitrogen at a low rate.

15. Take frequent samples through the top-pressure-gage connections and continue purging with nitrogen until the samples show the air has been removed. When gas analysis shows nitrogen content of 90 vol. %, the tank is considered safe for hydrocarbon displacement.

16. Block or blind all nozzles on top of the vessel except relief valves and vacuum vents. Start draining the vessel of water and displace the water with natural gas, maintaining a positive pressure (3 to 5 psig.) on the tank at all times.

17. All tests on this vessel are to be conducted at 60° F. minimum temperature for water.



Monthly Report on PIPELINE CONSTRUCTION

PIPELINE ACTIVITY reported here is compiled from surveys by The Oil and Gas Journal among pipeline companies and contractors.

This summary appears in the last issue each month. New projects are reported weekly under Pipeline Briefs.

Projects are listed in three groups—U. S., Canadian, and Foreign—and according to type of line—crude, products, natural gas, or miscellaneous.

★ The star symbol indicates the first appearance of the project in the Journal's survey.

U. S. Crude Oil Pipelines

ASHLAND OIL & REFINING CO., Ashland, Ky.
Project: 24-mile, 6-in., from Blaine, Ky., to Catlettsburg, Ky.
Completion: Sept. 1, 1961.

BEN FRANKLIN REFINING, P. O. Box 2007, Tulsa, Okla.
Project: 11-mile, 6-in., 2-mile, 8-in., Healdton to Ardmore, Okla.
Completion: Sept. 30, 1961.

CONTINENTAL PIPE LINE CO., Drawer 1267, Ponca City, Okla.
Project: 4-mile, 3-in., 18, 4-in., 68, 6-in., 323, 8-in., and 53, 10-in., Glacier System from Cutbank, Mont., to Byron, Wyo.
Status: Under way.
Contractor: R. H. Fulton & Co., Lubbock, Tex.
Completion: Feb. 1962.
Project: 20.7-mile, 8-in. crude line from Grand Isle to Golden Meadow, La.
Completion: December 31, 1961.
Contractor: Glaser Construction Co.

GILLETTE PIPELINE, INC., and A. W. HARTWIG, INC., Billings, Mont.
Project: A 102-mile line from Dead Horse Creek field to Casper, Wyo.
Status: Pending Wyoming Public Service Commission approval.

GREAT NORTHERN PIPE LINE CO., 175 East 4th St., St. Paul 1, Minn.
Project: 64-mile extension to the Lignite field, Burke County, North Dakota.
Status: Planned for 1961.

INTERSTATE OIL PIPE LINE CO., Box 1107, Shreveport, La.
Project: 11-mile, 6-in. Baton Rouge to Dixie Pipe Line near Baker, La.
Status: Planned.

KERR-McGEE OIL INDUSTRIES, INC.,
Completion: Nov. 30, 1961.
Oklahoma City, Okla.
★ Project: 10 miles, 2, 6 and 8-in. gathering lines, Pinta Dome field, Arizona.
Completion: Nov. 1, 1961.
Contractor: Northwest Construction, Inc.

MATADOR PIPE LINE CORP., Denver, Colo.
Project: 175-mile line from Burke, Bottineau, and Renville counties, North Dakota, to Cromer, Man.
Status: Pending approval of Canadian National Energy Board.

MID-CONTINENT PIPE LINE CO., Tulsa.
Project: 9-mile, 6-in. crude oil line from Crider field to Maysville station, Okla.
Status: Planned.

NORTHWESTERN REFINING CO., Box 248, St. Paul Park, Minn.
Project: 4, 6, and 8-in. gathering lines in Glenburn field, Renville and Bottineau counties, North Dakota.
Status: Has state approval.

OVERLAND PIPELINE INC., Wichita, Kans.
Project: 4-in. gathering system in Lone Tree field, Wyo., and transmission line to connect with Plains Pipeline Division of Franklin County Coal Corp.
Status: Application before Wyoming PSC.

SHELL PIPE LINE CORP., Box 2648, Houston 1, Texas.
Project: 25.3 miles, 6-in., 2.2 miles, 4-in., Conley field to South Vernon Junction.
Completion: Third quarter, 1961.
Contractor: Flint Rig Co.
Project: 7-mile, 2-in., Sealy gas plant to Hope Houston line.
Completion: Third quarter, 1961.

SINCLAIR PIPE LINE CO., Independence, Kans.
Project: 170-mile, 8-in. from Stockholm to Panova, Okla.
Completion: Sept. 15, 1961.
Status: Under way.
Contractor: R. H. Fulton & Co.

TETON PIPE LINE CORP., 1700 Broadway, Denver 2, Colo.
Project: 45 miles, 6-in. in Dead Horse Creek, Barber Creek, and Sussex fields in Campbell and Johnson counties, Wyoming, to connect with Service Pipe Line Co. at Sussex.
Status: Approved by Wyoming PSC.

U. S. Products Pipelines

AMERICAN PETROFINA CO., Rockefeller Center, New York, N. Y.
★ Project: 133-mile. 6-in. line from Mt. Pleasant to Dallas-Ft. Worth area.
Status: Planned.

CARL M. LOEB, RHOADES & CO., 42 Wall St., New York 5.
Project: 75-mile, 20-in. from New Jersey refineries to Long Island airports, Idlewild and La Guardia.
Status: Proposed.

CONTINENTAL PIPE LINE CO., Bartlesville, Okla.
★ Project: 225-mile products line, Ponca City, Okla., to Wichita Falls, Texas.
Status: Planned.

DIXIE PIPE LINE CO., 800 Enterprise Building, Tulsa.
Project: 1,077-mile, 12, 10, 8 and 6-in. LPG line from Mont Belvieu, Tex., to Cary, N. C.
Status: Under way.
Completion: Fall, 1961.
Contractors: Section 1, Houston Contracting Co.; Section 2, Sharman, Allen, Gay & Taylor; Section 3, H. B. Zachry Co.; Section 4, O. R. Burden Construction Co.; Section 5, Stanley-Bledsoe Corp.

EL PASO NATURAL GAS CO., El Paso, Tex.
Project: 58-mile, 6 in. LPG line Jal, N. M., plant to El Paso Natural Gas Products Co. refinery, Odessa, Tex.
Status: Planned.

GREAT LAKES PIPE LINE CO., Kansas City, Mo.
Project: Conversion of 6-in. products lines from Des Moines, Iowa, to Minneapolis and to Chicago area to tie-in with Northern Gas Products LPG line from Bushton, Kans.
Status: Planned.

HUMBLE PIPE LINE CO., Box 2220, Houston, Tex.
Project: 6.6-mile, 4-in. products line from Irving to Amon Carter field.
Status: Planned.
Completion: September 1961.

INTERSTATE OIL PIPE LINE CO., Box 1107, Shreveport, La.
Project: 11-mile, 6-in., Baton Rouge, La., to Dixie Pipe Line near Baker, La.
Status: Planned.
Completion: Nov. 30, 1961.

MID-AMERICA PIPELINE CO., 1437 S. Boulder, Tulsa.
Project: 106-mile, 6⅝-in. extension from Whiting to Ogden, Iowa.
Status: Under way.
Contractor: Bristow - Hyde Construction Co.
Completion Oct. 15, 1961.
Project: 100-mile extension from Ogden to Charles City, Iowa.,
Status: Planned.
Construction: 1962.

NORTHERN GAS PRODUCTS CO., Omaha, Neb.
Project: 350-mile, 8-in. LPG line from Bushton, Kans., plant to Des Moines, Iowa, connecting with Great Lakes 6-in. lines to Twin Cities and to Chicago area.
Status: Planned.

OLYMPIC PIPELINE CO. (proposed)
★ Project: 94 miles, 16-in.; 162 miles, 11-in., 45 miles, 8-in. and 23 miles, 6-in. from Ferndale and Anacortes, Wash., refineries to Seattle and Portland.
Status: Planned.

POTOMAC PUBLIC SERVICE CO., Arlington. Va.
Project: 80-mile, Baltimore to Washing- airports.
Status: Planned.

SINCLAIR PIPE LINE CO., Independence, Kans.
★ Project: 3-mile, 8-in. line to Patterson terminal, Paulsboro, N. J., to existing line.
Status: Planned.

SUNOLIN CHEMICAL CO., 1608 Walnut St., Philadelphia, Pa.
★ Project: 80-mile, 4 and 6-in. products and chemicals line, Deepwater to Paulsboro, N. J.
Completion: Oct. 1, 1961.
Contractor: Sheehan Pipe Line Construction Co.

TEXAS EASTERN TRANSMISSION CORP., Box 1189, Houston 1, Tex.

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PIPELINE CONSTRUCTION

Project: 6-mile, 8-in., Deer Park to Pasadena, Texas.
Status: Planned.

WEST SHORE PIPE LINE CO., 1033 First Ave., Des Plaines, Ill.
Project: 285-mile, 10-16-in. line from East Chicago, Ind., to Green Bay, Wis.
Status: Under way.
Completion: Mid-September 1961.
Contractors: Section One, 10 miles in Lake County, Indiana, Midwestern Contractors, Inc.; Section Two, 36 miles in Cook and Will counties, Illinois, and Section Three, 33 miles in Cook and Du Page counties, Illinois, Contracting and Materials Co.; Section Four, 63 miles in Cook and Lake counties, Illinois, and Kenosha, Racine and Milwaukee counties, Wisconsin, Houston Contracting Co.; Section Five, 43.5 miles in Milwaukee and Waukesha counties, Wisconsin, and Section Seven, 29 miles in Brown County, Wisconsin, Sommerville Construction Co., and Section Six, 76 miles in Milwaukee, Washington, Sheboygan, Calumet and Manitowoc counties, Wisconsin, Panama-Williams Corp.

YELLOWSTONE PIPE LINE CO., Ponca City, Okla.
Project: 82-mile, 6-in. products line from Helena to Great Falls, Mont.
Completion: Dec. 1, 1961.
Contractor: R. H. Fulton & Co.

U. S. Natural Gas Pipelines

ALABAMA-TENNESSEE NATURAL GAS CO., Box 380, Florence, Ala.
Project: 3½-mile, 6-in. line to serve Armour Agricultural Chemical in Colbert County, Alabama.
Status: Planned.

ALAMO GAS SUPPLY CO., Alamo National Building, San Antonio, Tex.
Project: 166 miles of 20, 22, and 24-in. line and 101 miles of 12, 16, and 24-in. line from Texas Gulf Coast to San Antonio.

ALASKA PIPE LINE CO., Houston, Tex.
Project: 74 miles, Kenai to Anchorage.
Status: Construction resumed.
Project: Extension of Kenai-Anchorage line to Fairbanks.
Status: Feasibility studies ordered.

ALGONQUIN GAS TRANSMISSION CO., 25 Faneuil Hall Square, Boston 9, Mass.
★ Project: 5.6 miles, 8-in. near Plymouth, Mass.
Status: Temporary FPC approval.

AMERICAN LOUISIANA PIPE LINE CO., Detroit, Mich.
Project: 25-mile, 8-in. to connect Holly Ridge field, Tensas Parish, Louisiana, to main line.
Status: Pending FPC approval.

ANADARKO PRODUCING CO., (Panhandle Eastern subsidiary), Box 1348, Kansas City 41, Mo.
Project: 83-mile, 10-12-in., from Spivey-Grabs-Basil field to Skelly Oil Refinery, El Dorado, Kans.
Contractor: R. H. Fulton & Co.

ARKANSAS WESTERN GAS CO., Box 405, Fayetteville, Ark.
Project: New lines from Altus, Coal Hill, and Rock Creek fields to the main system.
Status: Approved by Arkansas PSC.

BORDER GAS TRANSMISSION CORP. (Lehman Brothers, New York, and Rio Gas Gathering Co., 615 National Bank of Commerce Building, San Antonio 5, Tex.).
Project: Gathering lines in Starr, Zapata, Jim Hogg, Brooks, and Webb counties, Texas.
Status: Proposed.
Project: Gathering lines in Dimmit, Zavala, and La Salle counties, Texas.
Statusá Proposed.

CAROLINA PIPELINE CO., 4445 Devine St., Columbia, S. C.
Project: 67-mile, 8⅝-in., 20-mile, 10¾-in., Aiken to Camden, S. C.
Completion: Oct. 1, 1961.
Contractor: Panama-Williams Corp.

CITIES SERVICE GAS CO., Box 1995, Oklahoma City 1, Okla.
Project: 10½ miles of 8-in. to connect Rounds and Porter plant with main line in Marion County, Kansas.
Status: Planned.
Project: Gathering lines in Sterling field, Comanche County, Oklahoma.
Status: Pending FPC approval.

COASTAL TRANSMISSION CO., Houston, Tex.
Project: 71 miles laterals in Florida.
Status: Approved by FPC examiner.

COLORADO GAS TRANSMISSION CO., Colorado Springs, Colo.
Project: 250-mile, 20-in. line, from Ignacio-Blanco area, Southwest Colorado, to Walsenburg, Pueblo and Colorado Springs, Colo.
Status: Application before Colorado PUC.

COLORADO INTERSTATE GAS CO., Box 1087, Colorado Springs, Colo.
Project: 7 miles of 20-in. in Texas Panhandle.
Status: Pending FPC approval.
Completion: 1961.
Project: 109 miles of 26-in. from Texas Panhandle to southeastern Colorado; 134 miles of 34-in. from there to Pueblo, and 107 miles of 30-in. on to Denver.
Status: Pending FPC approval.
Project: 155 miles of 34-in. from Rock Springs, Wyo., to Provo, Utah, to connect with El Paso's proposed 395-mile line to California.
Status: Approved by FPC.
Completion: 1963.
Project: 32 miles of 6-in. from Central Colorado to Trinidad.
Status: Pending FPC approval.

COLORADO OIL & GAS CORP., Denver, Colo.
Project: 402-mile line from Gubik field to Fairbanks, Alaska.
Statusá Proposed.

COLORADO-WYOMING GAS CO., Box 480, Denver 1, Colo.
Project: 4-mile, 3-in. lateral to Erie, Colo.
Status: Pending FPC approval.
Project: 2-mile, 4-in. lateral to Niwot, Colo.
Status: Pending FPC approval.
Project: 16.7-mile, 16-in. from Arsenal Junction to Louisville, Colo.
Status: Pending FPC approval.

COLUMBIA GAS SYSTEM, INC., 120 East 41 St., New York 17.
Projects: Eight loops totaling 96.9 miles, 30-in. in Kentucky, Tennessee, Mississippi and Louisiana, plus 29 miles of 12-in. gathering line from near Houma, La., to the Texaco Dog Lake field.
Status: Planned.
Completion: 1961.

COLUMBIA GULF TRANSMISSION CO., Box 683, Houston 1, Tex.
Project: 9½ miles, 10-in. gathering line, Marguerite to Ivanhoe, La.
Status: Under way.
Project: 0.9 mile, 6-in. gathering line in Terrebonne Parish, Louisiana.
Status: Under way.
Project: 97 miles of main-line loop in Kentucky, Tennessee, Mississippi, and Louisiana, and 29 miles of 12-in. lateral supply lines in Louisiana.
Status: Pending FPC approval.
Completion: 1961.

COMMONWEALTH NATURAL GAS CORP., 116 South 3rd St., Richmond, Va.
Project: 8.97-mile, 16-in. line from Valve 19 to Valve 20 near Suffolk, Va.
Completion: September 1961.
Contractor: Latex Construction Co. of Georgia.

EAST TENNESSEE NATURAL GAS CO., Knoxville, Tenn.
Project: 10.1 miles, 4-in. lateral to South Carthage, Tenn., and 13.4 miles, 6-in. lateral to Pleasant Hill, Tenn.
Status: Planned.

EL PASO GAS SUPPLY CO., (subsidiary of El Paso Natural Gas Co., Box 1492, El Paso).
Project: 228-mile, 30-in. line, Live Oak County to Sonora, Sutton County.
Status: Pending FPC approval.

EL PASO NATURAL GAS CO., Box 1492, El Paso, Tex.
Project: 61.3-mile, 10¾-in. lateral to Bremerton, Wash., to be extended 75 miles to Port Angeles by Natural Gas Transmission Co., El Paso subsidiary.
Status: Before FPC.
Project: 8.2-mile, 34-in. loop on Gallup discharge.
Status: Pending FPC approval.
Project: 14.2-mile, 6⅝-in., South Sawyer to Sinclair plant 29.
Status: Pending FPC approval.
Project: 17 mile, 8⅝-in. from Pacific Gas Transmission 36-in. line to Klamath Falls, Ore.
Status: Pending FPC approval.
Project: 37.4 miles, 8⅝-in., San Juan Main line to Snowflake meter station.
Status: Approved.
Completion: December 1961.
Project: 17-mile, 30-in. loop on Coeur d'Alene lateral.
Status: Approved.
Completion: Oct. 1, 1961.

EQUITABLE GAS CO., 420 Boulevard of the Allies, Pittsburgh, Pa.
Project: 17 miles of 20-in. in Greene and Washington counties, Pennsylvania.
Status: Approved by FPC.
Completion: October 1962.

GRAND VALLEY TRANSMISSION CO., Green River, Utah.
★ Project: 16-mile line from Westover field, Grand County, to El Paso Natural Gas Co. main line.
Status: Approved by FPC.

HOUSTON TEXAS GAS & OIL CORP., Box 10400, St. Petersburg 33, Fla.
Project: 235 miles of various size laterals in Florida.
Status: Approved by FPC examiner.

HUMBLE OIL & REFINING CO., Houston, Texas.
★ Project: 13.5-mile, 26-in. line from Port Acres to Bridge City, Texas.

IROQUOIS GAS CORP., Buffalo, N. Y.
★ Project: 21.5 miles of line, 2 miles, 16-in.; 5.5 miles, 12-in.; 14 miles, small diameter, to serve Perrysburg storage.
Status: Before FPC.

KANSAS-NEBRASKA NATURAL GAS CO., INC., Hastings, Neb.
Project: 6.3-mile, 8-in. gas line to serve coop fertilizer plant at Hastings, Neb.
Completion: Sept. 1, 1961.
Project: 24.5 miles, 8-in. gas line from Huntsman to Northport, Neb.
Completion: Oct. 1, 1961.

LO-VACA GATHERING CO. (see parent company, Coastal States Gas Producing Co.).

MANUFACTURERS LIGHT & HEAT CO., Union Trust Building, Pittsburgh 19, Pa.
Project: 10½ miles of 24-in. Washington

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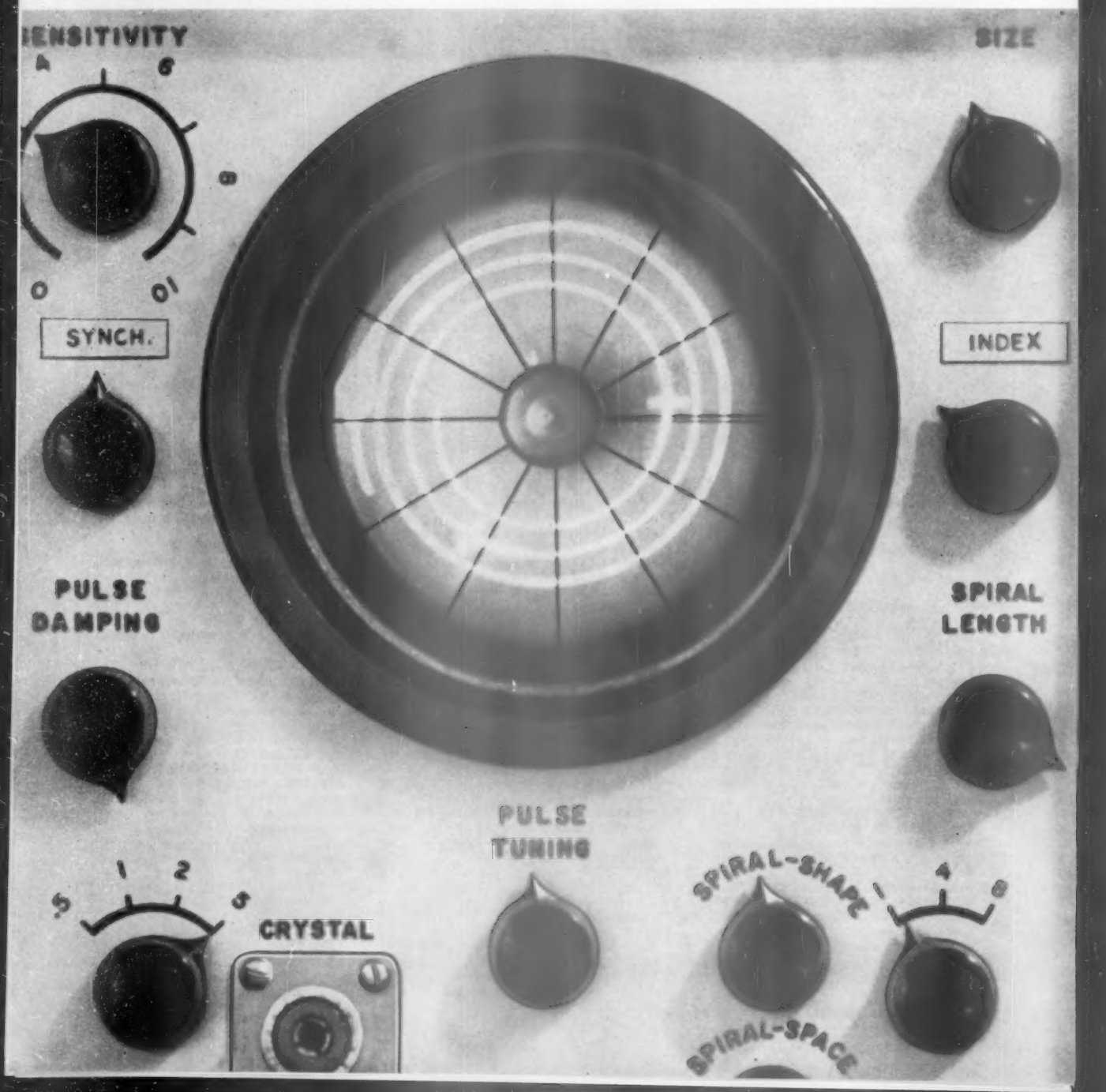

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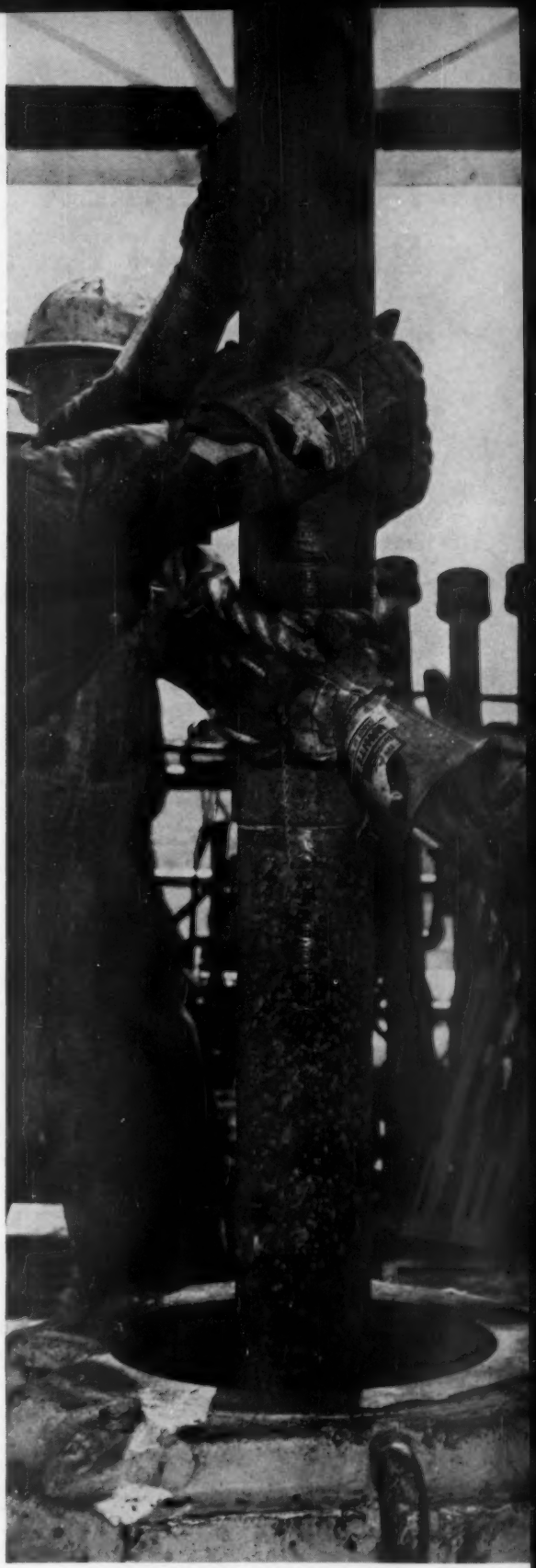

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PIPELINE CONSTRUCTION

and Beaver counties, Pennsylvania.
Status: Planned.
Completion: September 1961.
Project: 20-mile, 20-in., Glenville, W. Va., to New Milton District.
Status: Pending FPC approval.
Completion: December 1, 1961.

MICHIGAN WISCONSIN PIPE LINE CO., 500 Griswold St., Detroit, Mich.
Project: 64.5 miles, 4/10-in. Laverne field gathering lines.
Status: Planned.
Completion: Gradually over 1961.
Project: 97 miles, 16/20-in. gas line from Woodward, Okla., area to Greensburg, Kans., compressor station.
Status: Approved by FPC.
Project: 68 miles, 4/10-in. gathering system, Woodward, Okla., area.
Status: Approved by FPC.
Project: 26 miles, 30-in. loop in Michigan, 10 miles, 12-in. loop in Wisconsin.
Status: Pending FPC approval.
★ Project: 30 miles, 30-in. from Station 10 to Woolfolk station, Wisconsin.
Status: Approved by FPC.

MISSISSIPPI RIVER FUEL CORP., 407 North 8th Street, St. Louis 1, Mo.
Project: 5 miles of 16-in. and 15 miles of 12-in. from Collinsville, Ill., to St. Jacob, Ill.
Status: Pending FPC approval.

MONTANA-DAKOTA UTILITIES CO., Minneapolis, Minn.
Project: 106-mile, 12-in.; 22-mile, 3-in.; 20-mile, 2-in., Minot to Bismarck, N. D.
Status: Pending FPC approval.
Project: 12-mile, 6-in.; 17-mile, 4-in.; 2-mile, 2-in., Alexander to Watford City, N. D.
Status: Pending FPC approval.
Project: 14-mile, 8-in., McGregor to Tioga, N. D.
Status: Pending FPC approval.
Project: 3-mile, 3-in., lateral to Fryburg, N. D.
Status: Pending FPC approval.
Project: 2-mile, 4-in., lateral to Holly Sugar Corp., Hardin, Mont.
Status: Pending FPC approval.

MONTANA POWER CO., Box 1338, Butte, Mont.
Project: 16-in. line from Carway, Alta., to Cut Bank, Mont.
Contractor: Majestic Contractors, Inc.
Completion: 1961.

MOUNTAIN FUEL SUPPLY CO., Salt Lake City, Utah.

MOUNTAIN FUEL SUPPLY CO.
Project: 104-mile, 20-in. line from Ouray to Clearcreek, Utah.
Completion: Oct. 1, 1961.
Contractor: J. C. Cheeves.

NATURAL GAS PIPELINE CO. OF AMERICA, 122 South Michigan Avenue, Chicago.
★ Project: 62-miles, 30-in., Marshall to Spring, Tex.
Completion: Oct. 15, 1961.
Contractor: Panama-Williams Corp.
★ Project: 72 miles, 30-in., Hungerford to Refugio, Tex.
Completion: Oct. 15, 1961.
Contractor: Panama-Williams Corp.

NORTHERN NATURAL GAS CO., 2223 Dodge St., Omaha 1, Neb.
Project: 65-mile, 16-in. line from Duluth to Reserve Mining, Minn.
Contractor: Curran & Co.
Completion: Aug. 1, 1961.
Project: 11.5 miles, 30-in.; 62.7 miles, 16-in. and 1.2 miles, 4-in. to serve towns of Silver Bay and Two Harbors, Mich., and Reserve Mining Co., Silver Bay.
Status: Conditionally approved by FPC.
Projects: 1,100 miles of laterals:
116 miles, 2-8 in. to 20 Minnesota towns.
Contractor: Davis Construction Co.
136 miles, 2-8 in. to 26 Minnesota towns.
Contractor: Harbert Construction Co.
426 miles, 2-19 in. to 62 Iowa towns.
Contractor: R. H. Fulton & Co.
130 miles, 2-8 in. to 25 Iowa and Nebraska towns.
Contractor: Shamrock Construction Co.
176 miles, 2-8 in. to 29 Iowa, Nebraska, South Dakota towns.
Contractor: Brodie Construction Co.
116 miles, 2-8 in. to 15 Minnesota, South Dakota towns.
Contractor: R. E. Reutzel Co.
Status: Under way.
Completion: September 1, 1961.
★ Project: 99 miles, 30-in.; 123.5 miles 26-in.; 6 miles, 24-in. and 82.5 miles, 20-in., midwestern states.
Status: Approved by FPC.

OKALOOSA COUNTY GAS DISTRICT, Box 548, Valparaiso, Fla.
Project: 33-mile, 10-in., Milton to Ft. Walton, Fla.
Completion: Nov. 1, 1961.
Contractor: E. L. Walker, Pensacola, Fla.

OKLAHOMA-ILLINOIS GAS PIPELINE CO., M. & M. Bldg., Houston 1, Texas. (Joint Fish Engineering Corp. and Pan American Petroleum Corp. venture.)
Project: 550-mile, large diameter line from Woodward, Okla., to St. Louis, Mo.
Status: Proposed.

PACIFIC GAS & ELECTRIC CO., 245 Market St., San Francisco, Calif.
Project: 67 miles of line from Kettleman Hills to Morro Bay, Calif.
Project: 120 miles of 34-in. looping of Topock-Milpitas main line.
Status: Planned. Pending FPC approval.
Completion: 1963.
Project: 291 miles of 36-in. from the California-Oregon border to Antioch, Calif. (Part of a 1,400-mile project to move Alberta gas to San Francisco.)
Contractor: H. C. Price Co., Bartlesville, Okla. (Bechtel Corp. San Francisco, is the engineering manager.)
Status: Under way.
Completion: Dec. 1961.

PACIFIC GAS TRANSMISSION Co., (Pacific Gas & Electric Co., San Francisco).
Project: 611 miles of 36-in. from the Canadian border at Eastport, Idaho, to the California border near Klammath Falls, Ore. (Part of a 1,400-mile project to move Alberta gas to San Francisco.)
Contractors: Western Pipe Line, Inc., Austin, Tex., and J. P. Neill & Co., Dallas, have contracts for the 465-mile southern portion. H. C. Price Co., Bartlesville, Okla., has contract for the 146-mile northern portion from Rosalia, Wash., to Eastport, Idaho. (Bechtel Corp., San Francisco, is the engineering manager.)
Status: Under way.
Completion: Dec. 1961.

PANHANDLE EASTERN PIPE LINE CO., 120 Broadway, New York.
Project: 298 miles of 30-in. loops, 43 miles of 16 to 26-in. supply laterals, and 80 miles of 6 to 12-in. sales laterals.
Status: Pending FPC approval.
★ Project: 150 miles, 24-in., 50 miles, 22-in. from Elk City, Okla., field to main line.
Status: Approved by FPC.

PHILLIPS PETROLEUM CO., Bartlesville, Okla.
Project: 16 miles of 2 to 8-in. gathering line in Eddy County, New Mexico.
Status: Planned.
Project: 17 miles of 4 to 10-in. gathering line in Midland County, Texas.
Status: Planned.

PIONEER NATURAL GAS CO., Amarillo, Tex.
Project: 21 miles of 12-in. from Sudan to Muleshoe, Tex.
Status: Pending FPC approval.
Project: 12 miles of 10-in. from Muleshoe, Tex., northward.
Status: Pending FPC approval.

PIPELINE TECHNOLOGISTS, INC., Houston, Tex.
Project: 50 miles various size lines, gas gathering system, Marion County, Kansas.
Completion: September 1961.

SOUTH GEORGIA NATURAL GAS CO., Box 791, Thomasville, Ga.
Project: 2½-mile, 3½-in. from main line to Sylvester, Ga.
Completion: November 1961.
Project: 2½-mile, 3½-in. from main line to Ocilla, Ga.
Completion: November 1961.

SOUTHERN CALIFORNIA GAS CO., and SOUTHERN COUNTIES GAS CO. OF CALIFORNIA, Los Angeles, Calif.
Project: 92.9-mile, 34-in., Ivanpah to Newberry, Calif.
Status: Approved by California PUC.
Completion: Jan. 1, 1964.

SOUTHERN NATURAL GAS CO., Birmingham, Ala.
Project: 14.4 miles, 20-in. gas line from Gwinville field to Pickens station.
Status: Pending FPC approval.
Completion: Dec. 31, 1961.

SOUTHERN UNION GAS CO., Fidelity Union Tower, Dallis 1, and **EL PASO NATURAL GAS CO.,** Box 1492, El Paso, Tex.
Project: 60-mile line from El Paso's main line near Holbrook, Ariz., to paper mill under construction near Snowflake.
Status: Planned.

ST. LAWRENCE GAS CO., Ogdensburg, N. Y.
Project: 75 miles of line near Cornwall, Ont., to Ogdensburg, N. Y.
Status: Approved by FPC.

TENNESSEE-CALIFORNIA GAS TRANSMISSION CO., Box 2511, Houston, Tex.
Project: 105-mile, 26-in. line from Humble's King Ranch via Kleberg, Brooks and Hidalgo counties to Mexican border to connect with Tennessee-Pemex line to California. Included are 69 miles of 12-in. and smaller laterals.
Status: Pending FPC decision.

TENNESSEE GAS PIPELINE CO., a division of Tennessee Gas Transmission Co., Box 2511, Houston 1, Tex.
Project: 8.1-mile, 16-in. gathering line, offshore Louisiana.
Status: Approved by FPC.
Project: 6-mile, 12-in. gathering line, offshore Louisiana.
Status: Approved by FPC.
Project: 18.5 miles, 12-in. gathering lines, offshore Louisiana.
Status: Approved by FPC.
Project: 12.6 miles, 12-in. gathering lines, offshore Louisiana.
Status: Approved by FPC.
Project: 9.8 miles, 10-in. gathering lines, offshore Louisiana.
Status: Pending FPC approval.
Project: 20.6 miles, 12-in. gathering lines, offshore Louisiana.
Status: Pending FPC approval.
Project: 13 miles, 20-in. gathering lines, offshore Louisiana.
Status: Approved by FPC.
Project: 7.4 miles, 12-in. gathering lines, offshore Louisiana.
Status: Approved by FPC.
Project: 158 miles of 36-in. loop lines at

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ACF INDUSTRIES

PIPELINE CONSTRUCTION

various points between Kinder, La., and Centerville, Tenn.
Status: Approved by FPC.
Project: 166 miles of 36 and 30-in. loop lines at various points in Ohio and Pennsylvania.
Status: Pending FPC approval.

TENNESSEE GAS TRANSMISSION CO., Box 2511, Houston, Tex.
Project: 1,100-mile, 30-in. line Texas to California via Mexico (see Foreign).
Project: 292-mile line from the California-Mexican border to Los Angeles to tie in with above-mentioned line.
Status: Tennessee Gas' subsidiary, California Gas Transmission Co., and Southern California Edison Co. have applied to California PUC. Also pending FPC approval.
Project: A line from King Ranch, Texas, to the Mexican border, to connect with proposed line through Mexico to California.
Status: Tennessee Gas subsidiary, Tennessee California Gas Transmission Co., to build and operate the Texas segment.

TEXAS EASTERN TRANSMISSION CORP., Box 1189, Houston 1, Tex.
Projects: 165 miles of 20-in. from West Monroe, La., to Kosciusko, Miss.
Status: Underway.
Contractor: Houston Contracting Co.
Completion: 1961.
Project: 40 miles, 36-in., Station 26 to Station 27, N. J.
Status: Planned, authorized.
Contractors: H. C. Price Co., Napp-Grecco Co.
Completion: 1961.
Project: 89 miles, 30-in. Kosciusko station, Miss., and Station 21-A, Pa.
Status: Temporary FPC approval.
Completion: 1961.
Project: 40 miles, 30-in. Delmont station, Pa., to Station 26, N. J.
Status: Planned, filed with FPC.
Completion: 1961.
Project: 45 miles, 30-in. Delmont station, Pa., to Station 26, N. J.
Status: Planned, filed with FPC.
Completion: 1962.
Project: 42 miles, 30-in., Kosciusko station, Miss., to Station 21-A, Pa.
Status: Temporary FPC approval.
Completion: 1962.
Project: 57 miles, 14-in., Castor, La., to West Monroe, La.
Status: Planned, filed with FPC.
Completion: 1961.
Project: 13 miles, 14-in. Middlesex County, to Barnardsville, N. J.
Status: Planned, filed with FPC.
Completion: 1962.
Project: 14 miles, 12 in., Barnardsville to Roseland, N. J.
Status: Planned, filed with FPC.
Completion: 1961.
Project: 11 miles, 10-in., Middlesex County to Helvetta, N. J.
Status: Planned, filed with FPC.
Completion: 1961.
★ Project: 17.42 miles, 30-in. near Wilkesville, O. to Athens station.
Status: Underway.
Contractor: Western Pipe Line, Inc..
★ Project: 12 miles, 30-in., near Moundsville, W. Va., to Holbrook station, Pa.
Status: Underway.
Contractor: Western Pipe Line, Inc..

TEXAS GAS TRANSMISSION CORP., Owensboro, Ky.
★ Project: 61 miles, 30-in.; 26 miles, 26-in.; 33 miles 16-in.; 17 miles, 8-in.; 9 miles, 6-in. between Louisiana and Illinois.
Status: Approved by FPC.

TRANSCONTINENTAL GAS PIPE LINE CORP., 3100 Travis St., Houston, Tex.
Project: 25-mile, 30-in. main line loop, Texas.
Status: Underway.
Contractor: Houston Contracting Co.
Completion: 1961.
Project: 18-mile, 36-in. main line loop, Louisiana.
Status: Underway.
Contractor: Houston Contracting Co.
Completion: 1961.
Project: 35-mile, 36-in. main line loop, Mississippi.
Completion: 1961.
Project: 32-mile, 36-in. main line loop, Alabama.
Status: Underway.
Contractor: C. S. Lenoir Construction Co.
Completion: 1961.
Project: 59-mile, 36-in. main line loop, Georgia.
Completion: 1961.
Project: 36-mile, 36-in. main line loop, South Carolina.
Contractor: Williams Brothers.
Completion: 1961.
Project: 7-mile, 16-in. main line loop, New Jersey.
Completion: 1961.
Project: 19-mile, 36-in. main line loop, Louisiana.
Status: Underway.
Contractor: Houston Contracting Co.
Project: 30-mile, 36-in. main line loop, Mississippi.
Status: Pending FPC approval.
Project: 17-mile, 36-in. main line loop, Alabama.
Status: Underway.
Contractor: C. S. Lenoir Construction Co.
Project: 7-mile, 36-in. main line loop, Georgia.
Status: Underway.
Contractor: Williams Brothers.
Project: 15-imle, 36-in. main line loop, South Carolina.
Status: Underway.
Contractor: Williams Brothers.
Project: 20-mile, 36-in. main line loop, North Carolina.
Status: Underway.
Contractor: Williams Brothers.
Project: 28-mile, 36-in. main line loop, Virginia.
Status: Pending FPC approval.
Project: 27-mile, 36-in. main line loop, Maryland.
Status: Pending FPC approval.
Project: 69-mile, 24-in. storage line, Pennsylvania.
Status: Pending FPC approval.
Project: 37-mile, 3-8-in. offshore line, Louisiana.
Status: Pending FPC approval.
★ Project: 83.2-mile, 36-in. in Mississippi and Alabama.
Status: Underway.
Contractor: C. E. McNoir Construction Co.

TRANSWESTERN PIPELINE CO., 618 First City National Bank Building, Houston 2, Tex.
Project: Gathering system in West Texas and Oklahoma, approximately 100 miles, 4 to 6 in.
Status: Under way.
Contractor: Sheehan Pipe Line Construction Co.

TRUNKLINE GAS CO., Box 1642, Houston, Tex.
Project: 21.4-mile, 30-in. line from Vienna to Marion, Ill.
Completion: 1961.
Project: 21-mile, 30-in. line from Dry Creek to Pitkin, La.
Completion: 1961.
Project: 76 miles, 26-in. from Longville to Cow Island, La.
Completion: 1961.

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PIPELINE CONSTRUCTION

Project: 52 miles of 20-in. from Bayou Sale to Cow Island, La.
Contractor: Panama, Inc.
Completion: 1961.

★ Project: 21-mile, 18-in. line, Vermilion, Parish, La.
Status: Underway.
Contractor: Glaser Construction Co.

★ Project: 35-mile, 26-in. line, Cow Island to Jennings, La.
Status: Under way.
Contractor: Sharman, Allem, Gay & Taylor Inc.

UNITED GAS PIPE LINE CO., Box 1407, Shreveport 92, La.
Project: 217 miles of 30-in. from St. Mary Parish to near Monroe, La.
Status: Under way.
Contractors: Panama, Inc.;Stanley-Bledsoe, Inc.
Completion: Late 1961.
Project: 59 miles of 36-in. purchase lateral connecting Bastian Bay field, Louisiana.
Status: Under way.
Contractor: Panama, Inc.
Completion: Fall 1961.

UNITED GAS PIPE LINE CO.

★ Project: 61-mile, 30-in. from West Monroe to Jena, La.
Status: Under way.
Contractor: Panama, Inc.

WASHINGTON GAS LIGHT CO., 1100 H St., NW, Washington 5, D. C.
Project: 10.99 miles, 16-in. gas line near Lanham, Mo., and Lanham to Belair, Md.
Completion: September 1961.
Project: 20.66 miles various size distribution lines, Belair, Md.
Completion: September 1961.
Project: 15.5 miles, 24-in. gas line at Hybia Valley, Va.
Completion: October 1961.
Project: 16 miles of 24-in. from near Alexandria, Va., to Prince Georges County, Maryland.
Status: Approved by FPC.

WESTERN SLOPE GAS CO., Denver, Colo.

★ Project: 105 miles, 8-in.; 18 miles, 3-in.. 58 miles, 4-in., Ignacio to Del Norte, Colo.
Completion: Oct. 25, 1961.
Contractor: A. J. Curtis & Co.

U. S. Miscellaneous Pipelines

MONSANTO CHEMICAL CO., 800 North Lindbergh Blvd., St. Louis 66, Mo.
Project: 25-mile lines to move petrochemicals between proposed plant at Chocolate Bayou and Texas City.
Status: Planned.

SUNOLIN CHEMICAL CO., 1608 Walnut St., Philadelphia 3, Pa.
Project: Ten 8-in. chemical lines from SunOlin's plant at Claymont, across the Delaware River to Penns Grove, N. J.
Status: Planned.
Completion: Late 1961.

TEXAS EASTERN TRANSMISSION CORP., Box 1189, Houston 1, Tex.
Project: 350 miles of 24-in. coal-slurry line to move West Virginia coal to electric companies in Pennsylvania, New York and New Jersey. (Texas Eastern is working jointly with Consolidation Coal Co., Pittsburgh, Pa.)
Status: Proposed.

DOW CHEMICAL CO., Bay City, Mich.

★ Project: 25-mile, 2½-in. hydrogen line, Bay City to Midland, Mich.
Completion: Sept. 15, 1961.
Contractor: Welded Construction Co.

Canadian Crude Oil Pipelines

BRITAMOIL PIPE LINE CO., LTD., Box 130, Calgary, Alta.
Project: 64-mile 8-in. line from Dick Lake to Edmonton, Alta.
Status: Under way.

BRITISH COLUMBIA OIL TRANSMISSION CO., Taylor, B.C.
★ Project: 85-mile, small-diameter gathering system in Blueberry field with transmission line to Taylor.
Completion: December 1961.

FEDERATED PIPE LINES LTD., 304 Sixth Ave. West, Calgary, Alta., Canada.
Project: 10 miles, 4½/6⅝-in. gathering lines.
Completion: Indefinite.

HUDSON'S BAY OIL & GAS CO., LTD., 320 7th Ave., Calgary, Alta.
Project: 11 miles, 6-in.; 5.5 miles, 4-in., and 22 miles, 3-in. in miscellaneous gathering lines.
Status: Planned.
Completion: October 1, 1961.
Contractor: Arnett & Burgess Oilfield Construction Ltd.
Project: 41 miles of 4 and 8-in. condensate line from the Waterton-Castle River area and Pincher Creek field in southwestern Alberta to Carway near the U. S. border to connect with Continental Pipe Line's Glacier srude system in Montana and Wyoming.
Status: Approved by Alberta Conservation Board.

INTERPROVINCIAL PIPE LINE CO., Edmonton, Alta.
Project: 90-mile lateral, Hamilton, Ont., to Buffalo, N. Y.
Status: Filed with CNEB.

MATADOR PIPE LINE CORP., Denver, Colo.
Project: 175-mile line from Burke, Bottineau, and Renville counties, North Dakota, to Cromer, Man.
Status: Pending CNEB action.

PEACE RIVER OIL PIPE LINE CO. LTD., Box 130, Calgary, Alta.
Project: 161-mile, 12-in. from Kaybob area to Sdmonton with 7.5-mile, 8-in. lateral to Windfall.
Status: Under way.
Completion: Late 1961.

PETROGAS PROCESSING CO., LTD., Calgary, Alta.
Project: 208-mile gathering system, Balzac Alta., region.
Completion: Oct. 15, 1961.
Contractor: Banister Construction Co. Ltd.

RANGELAND PIPE LINE CO., Calgary.
Project: 111-mile line from Cessford field to Calgary.
Status: Pending approval of Alberta government.

ROYALITE OIL CO., LTD., Calgary, Alta.
Project: 26.5 mile, 8-in. Jumping Pound and Wildcat Hills absorption plants to Valley Pipe Line near Calgary.
Status: Under way.

TRANS-PRAIRIE PIPELINES, LTD., 12912 125 Ave., Edmonton, Alta.
Project: Expansion of gathering system in British Columbia, 40 miles, 4-in. from Taylor to Dawson Creek; 30 miles, 6-in. from Boundary Lake to Taylor. 75 miles, 8-in. from Taylor to Milligan Creek, 11 miles, 4-in. from Milligan Creek to West Beaten; and 4 miles, 8-in. near Taylor station.
Status: Under way.
Contractor: Banister Construction Co., Ltd., Edmonton.
Completion: Fall, 1961.

WESTERN PACIFIC PRODUCTS & CRUDE OIL PIPELINES, LTD., 1155 West Georgia St., Vancouver 5, B. C.
Project: 500-mile, 12-in. from Taylor, B. C., to Kamloops to connect with the Trans Mountain line to Vancouver.
Status: Under way.
Contractors: Canadian - Bechtel, north; Dutton-Williams, south.
Completion: Late 1961.

Canadian Natural Gas Pipelines

ALBERTA GAS TRUNK LINE CO., LTD., Calgary, Alta.
Project: 226 miles of 36-in. and 125 miles of 30-in., plus laterals in southern Alberta including 58 miles of 22-in. and 64 miles of 16-in. (Part of a 1,400-mile system Alberta to San Francisco.)
Contractors: Majestic Contractors, Ltd., Edmonton, haas 113 miles of 36-in. from Crowsnest Pass to Priddis, 63 miles of 30-in. from Rocky Mountain House to Cynthia, and 38 miles of 22-in. lateral to the Rimbey region. Mannix Co., Ltd., Calgary, has 113 miles of 36-in. from Priddis to Rocky Mountain House. Dutton-Williams Brothers, Ltd., Calgary, has 62 miles of 30 in. from Cynthia to near Whitecourt, Alta., as well as a 20-mile, 22-in. lateral to the Whitecourt area. Piggott Construction, Ltd., Edmonton, has 64 miles of 16-in. lateral from Crowsnest Pass to Carway, Alta., on the U. S. border.
Projects: Laterals to tie in with the above project: 15 miles of 12-in. to Buck
Completion: Dec., 1961.
Lake, 23 miles of 22-in. to East Calgary, 15 miles of 16-in. to Carstairs, 4 miles of 8-in. to Sarcee, and 10 miles of 10-in. built will connect Kaybob, Berland River, Lovett River, and Stolberg.

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PIPELINE CONSTRUCTION

ALBERTA NATURAL GAS CO., LTD. (Pacific Gas & Electric Co., San Francisco, and Westcoast Transmission, Calgary.)
Project: 108 miles of 36-in. from Crowsnest Pass across southeastern British Columbia to the U. S. border near Eastport, Idaho. (Part of 1,400-mile project from Alberta to San Francisco.)
Contractor: Price Poole of Canada, Ltd. (Canadian Bechtel, Inc., Toronto, is engineering manager.)
Completion: Dec., 1961.

CANADIAN INDUSTRIAL GAS, LTD. (formerly Ajax Petroleums, Ltd.), Derrick Building, Calgary, Alta.
Project: 28 miles of 10-in. and 4 miles of 8-in. from Morinville to Westlock Viking San field.
Status: Planned.
Completion: By September 1961.

CARTIER GAS CORP. (St. Maurice Gas Inc., and Consumers Gas Co., 19 Toronto St., Toronto.)
Project: Transmission and distribution in eastern townships and through to Quebec City in Quebec Province.
Status: Proposed.

GAS TRUNK LINE OF BRITISH COLUMBIA, LTD., Pacific Bldg., Calgary, Alta.
Project: 245-mile, 30-in. extension of Westcoast Transmission system from Taylor, B. C., to Fort Nelson.
Status: Delayed to 1963 or 1964.

MAGNA PIPELINE CO., LTD., Nanaimo, Vancouver Island, B. C.
Project: 53 miles of parallel 7-in. reinforced plastic pipe to serve Vancouver Island, B. C.
Status: Approved.
Completion: 1963.

NORTHERN ALBERTA PIPE LINES, LTD., Edmonton, Alta.
Project: 110-mile trunk line, plus gathering system, from Las La Biche, in McMurray vicinity, to Edmonton.
Status: Pending provincial approval.

SASKATCHEWAN POWER CORP., Regina, Sask.
★ Project: 35-mile, 4 and 6-in. line, Canora to Sturgis.
Completion: 1961.

SARATOGA PROCESSING CO., LTD., 406 Petroleum Building, Calgary, Alta.
Project: 67 mile gathering system (43 miles 16-in., 24 miles 4-10-in.) for Coleman, Alta., processing plant.

WESTCOAST TRANSMISSION CO., LTD., Calgary, Alta.
Project: 688-mile, 30-in. loop of British Columbia-Washington line.
Status: Proposed.
Project: See Alberta Natural Gas Co., Ltd., for joint project.)

Foreign Crude Oil Pipelines

ABU DHABIE MARINE AREAS, LTD. (partly owned by British Petroleum Co., Britannic House, Finsbury Circus, London E.C. 2).
Project: 20 miles of 18-in. from offshore Persian Gulf pool to Das Island.

ALGERIAN LINES.
Project: 75-mile 10-in. line to link the new oil field, El Gassi-El Agreb, with the existing Hassi Messaoud-Bougie line. SNPA is field operator.
Status: Planned.

ARABIAN AMERICAN OIL CO., 505 Park Ave., New York 22.
Project: 29-mile, 30/32-in., partial looping, Safaniya to Khursaniyah.
Status: Under way.
Completion: October 1961.
Project: 30-mile, 24-in. Safaniya offshore gathering line.
Status: Under way.
Completion: January 1962.
Project: 27-mile, 24-in. crude line from northern Safaniya to southern Safaniya.
Status: Planned.
Completion: Second quarter 1962.
Contractor: Aramco-Bechtel.

BASRAH PETROLEUM CO., London, England.
Project: 20 miles, 16-in. gathering lines, Rumaila.
Contractor: Mothercat Co., Ltd.
Completion: September 1961.
Project: 37-mile line from Rumalia field to power plant at Basra.
Status: Contract let.
Completion: March 1962.
Contractor: SAIPEM.

CIE. de RECHERCHE et d'EXPLOITATION PETROLIERE au SHARA, Paris.
Project: 40 miles, 4-8-in. gathering lines, El Adeb Larache field.
Status: Proposed.
Contractor: Socoman.
Completion: January 1962.

COUNCIL FOR MUTUAL ECONOMIC AID (Comecon).
Project: 2,800-mile system from the Volga-Ural oil fields in Russia to East Europe satellite countries.
Status: Construction under way in Poland, Hungary, and Czechoslovakia.

ENI, Milan, Italy.
★ Project: Central European System, 325 miles, 22-26-in., 300 miles, 14-18-in. from Genoa, Italy, to Aigle, Switzerland, to Ulm, Germany, with branches to Ingolstadt and Stuttgart.
Status: Underway.

IRANIAN OIL EXPLORATION & PRODUCING CO.
Project: 30 miles of 20-in. and 22 miles of 16-in. looping of Agha Jari to Bander Mashur line.
Status: Planned.

IRAQ PETROLEUM CO.
Project: Two 25-mile. 32-in. crude lines to offshore loading dock in Persian Gulf.
Status: Under way.

IRAQ PETROLEUM CO., LTD., 214 Oxford St., London W 1, England.
Project: Looping of Kirkuk-Mediterranean system 66-mile between K-1 and K-2 stations and 81-mile between K-3 toward Syria. In Syria, a 28-mile section of 30-in. is under way.

KUWAIT OIL CO., LTD., Burgan House, London, England.
Project: 31-mile, 24-in. crude line from Minagish to Ahmadi South tank farm.
Status: Planned.
Completion: Mid-1962.

MENE GRANDE OIL CO., Apartado 709, Caracas, Venezuela.
Project: 16-in. line at Block 11, Maracaibo.
Completion: December 1961.

OASIS OIL CO. OF LIBYA, 1270 Avenue of the Americas, New York 20, N. Y.
Project: 86-mile, 30-in. from Dahra field to El Sider; 36-mile, 20-in. from Mabruk to 30-in. line.

OIL INDIA, LTD., (Burmah Oil Co. and Assam Oil Co., two-thirds, and India Government, one-third.)
Project: 720 miles in northeast India, 250 miles of 16-in. from Nahorkatiya to Noonmati and 470 miles of 14-in. from noonmati to Barauni.
Contractors: Mannesmann, Germany, and SAIPEM, Italy.
Status: Under way.
Completion: 16-in. system, 1961.

PETROLEO BRASILEIRO S.A. (Brazil).
Project: 250-mile line from Rio de Janeiro to Belo Horizonte refinery site.
Status: Under consideration.
Project: 35 miles of 8 to 12-in. pipe from Buracica to Candeia.
Contractor: Techint, Inc., Milan, Italy.
Project: 80 miles of 24-in. to tie in to proposed Caxias refinery near Rio de Janeiro.
Status: Planned.

PHILLIPS PETROLEUM CO., Bartlesville, Okla.
Project: 14-in. line in Block 17, Lake Maracaibo, Venezuela.
Status: Planned.
Contractor: Chicago Bridge & Iron Co.

RHEIN-DONAU OELETUNG, G.m.b.H., Germany.
★ Project: Extension of South European Pipeline from Karlsruhe to Ingolstadt.
Status: Proposed.

ROYAL DUTCH-SHELL.
Project: 12-mile line from Gore Bay, Australia, to Royal Dutch-Shell's Clyde refinery.
Status: Planned.
Project: 161 miles 20-in. line from Tandzung field to Balikpapan refinery, Borneo.
Status: Planned.
Contractor: Williams Brothers Overseas, Ltd., Tulsa, and John Brown, Ltd., London.
Completion: January 1, 1962.

SINCLAIR VENEZUELAN OIL CO., Apartado 1706, Caracas. Venezuela.
Project: 17.35 miles, 8-in. crude line from East Aguasay to south bank of Tonoro River to connect with existing 8-in. line.
Status: Planned.
Completion: Late 1961.

SNAM-SUEDPETROL, Milan, Italy.
Project: 20-in. crude line from Genoa to Ingolstadt, Austria, via Switzerland.
Status: Planned. Construction expected to begin in 1961.

SOUTH EUROPEAN PIPELINE CO. (Jersey Standard, Caltex, Shell, British Petroleum, and 12 other firms.)
Project: 419-mile, 30 in. line from Lavera, near Marseille, to Strasbourg, with 40-mile extension to Karlsruhe, Germany. This may be extended into lower Batavia with a 155-mile, 22-in. segment.
Status: Under way.
Completion: 1963.

SYRIAN LINE.
Project: About 320 miles of 6-in. from interior of Syria to link Homs refinery with various fields.
Status: Under way.
Contractor: Techint, Inc., Milan, Italy.
Completion: 1961.

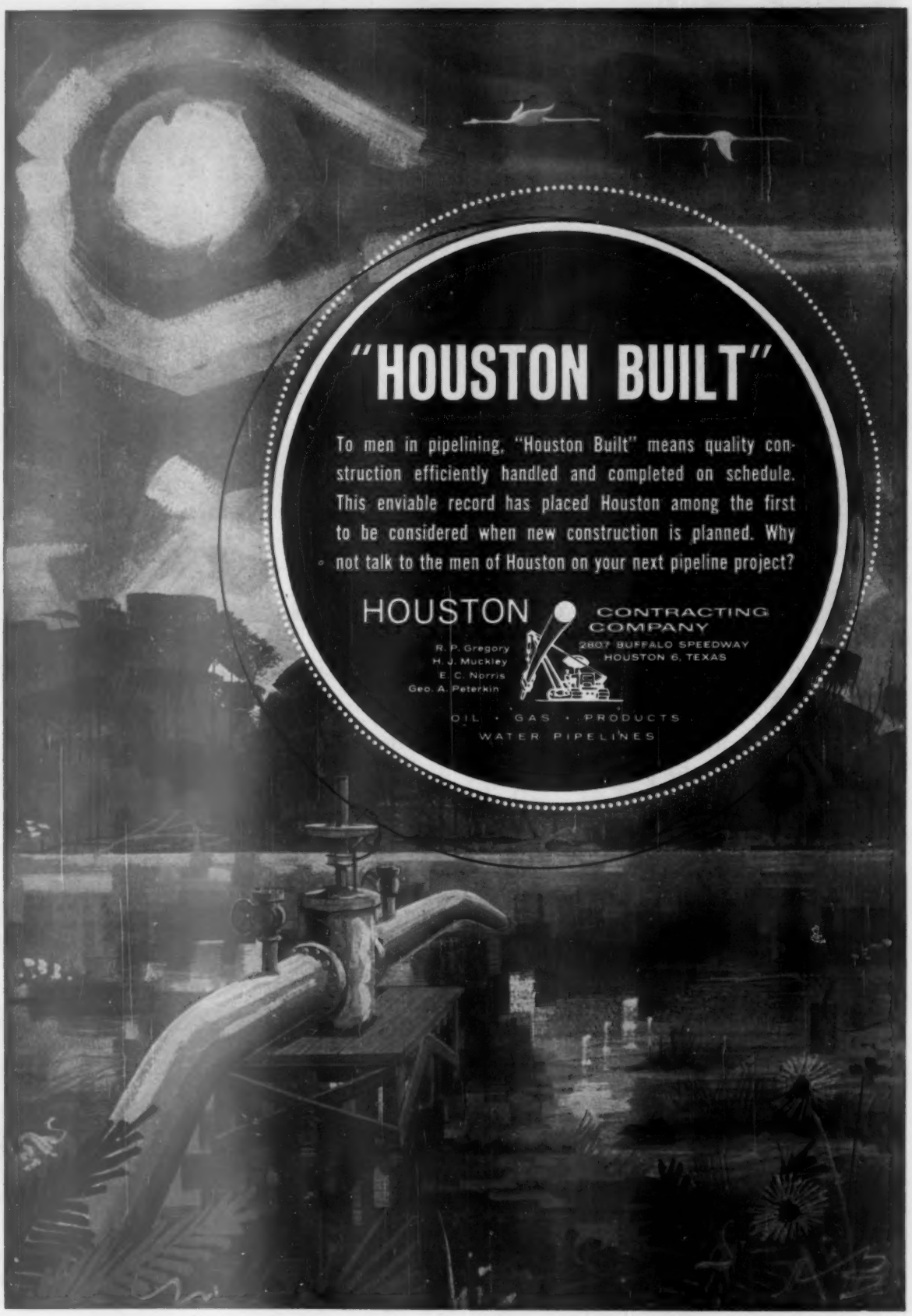
UNION OF SOVIET SOCIALIST REPUBLICS.
Project: 2,315-mile, 28-in. Trans-Siberian crude-products line from Ufa and Tuimazy fields, Bashiria, to Irkutsk.
Status: Under way.

YACIMIENTOS PETROLIFEROS FISCALES (Argentina), Buenos Aires.
Project: 390 miles, 14-in. from Neuquen Province to Bahia Blanca.
Status: Under way.
Project: 625 miles of 12-in. from Mendoza to San Lorenzo.
Status: Planned.

Foreign Products Pipelines

ARABIAN AMERICAN OIL CO., Dhahran, Saudi Arabia, and 505 Park Avenue, New York.
Project: 37 miles of 8-in. LPG line from Abqaik to 'Ain Dar.
Contractor: Aramco-Bechtel.
Completion: 1961.

BRITISH PETROLEUM CO., London.
★ Project: 12 mile, 4-6-in. from sealoading line to air terminal on Bahrain.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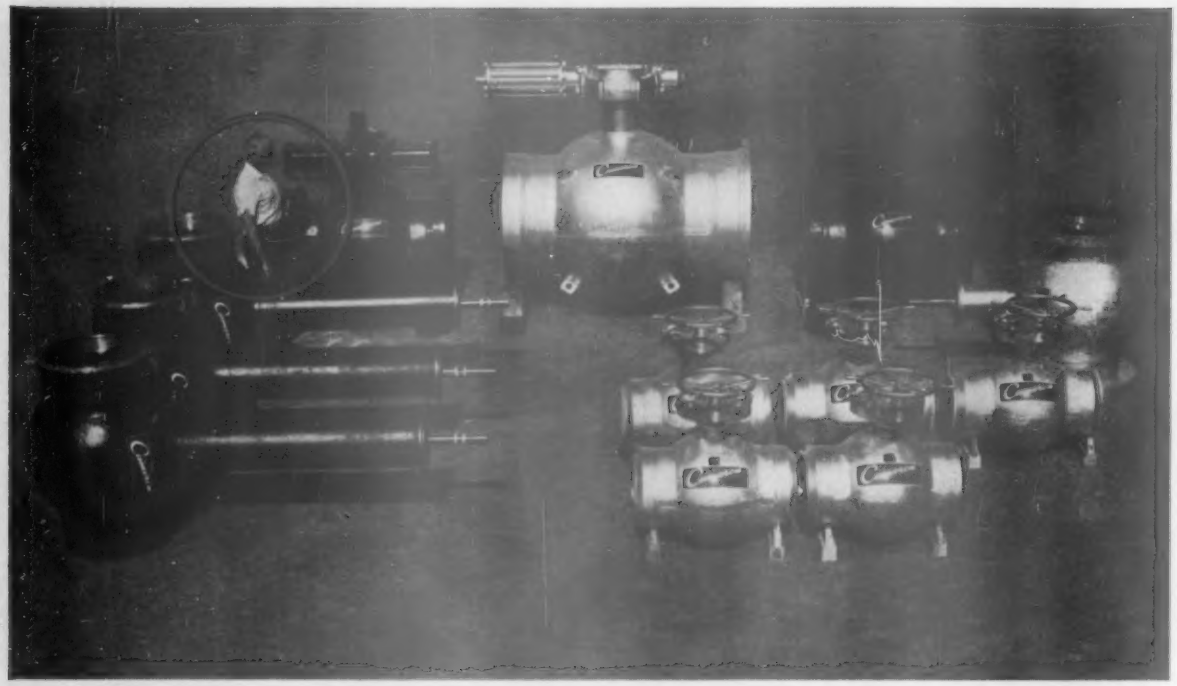
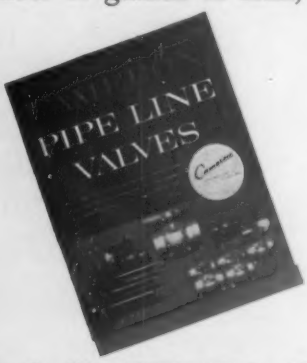


ACCEPTED BY PIPE LINES

Cameron Ball Valves are winning increasing acceptance by pipe line companies the world over. The companies like the compact design, the simplicity and the light weight in comparison with conventional valves. Cameron Ball Valves are easier to handle and easier to coat than conventional valves. There are no bonnets or glands to leak, and no lubrication is required either for sealing or to reduce friction in operating the valve. Torque required to operate the valve is amazingly low because the pressure of fluid against the ball is carried by low friction Teflon bearings, and the seat ring area in contact with the ball is small. A tight shutoff for countless operations is insured by the rotating seat design.



Ask a Cameron representative or write for a pipe line valve catalog.

Cameron

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CAMERON BALL VALVES

PIPELINE CONSTRUCTION

Contractor: Mothercat.

CALTEX, PAKISTAN, Karach, Pakistan.
★ Project: 15-mile, 4-12-in. harbor installation, Karachi.
Completion: September 1961.
Contractor: Mothercat.

CIE. FRANCAISE DE PETROLES, Paris, France.
Project: 187-mile, 8-in. condensate line from Hassi R'Mel dehydration plant to Haoud-el-Hamra station on Hassi Messaoud-Bougie crude oil line.
Status: Under way.

INDIA GOVERNMENT.
Projects: 600-mile line from Barauni to Delhi via Kanpur, Lucknow, and Allahabad; 300-mile dual crude and products line from Bombay to Bhusaval; 120-mile products line from Bombay to Poona to be extended 300 miles, later, to Hyderabad; and a 350-mile products line from Cochin to Madras via Bangalore.
Status: Proposed.

NATIONAL IRANIAN OIL CO., Tehran, Iran.
Project: 360 miles of 8-in. from Rey to Meshed, Iran.
Status: Under way.
Contractor: William Brothers, Tulsa.

PETROLEOS MEXICANOS, Avenida Juarez 92-94, Mexico City, Mexico.
Project: 350-mile, 12-in. Minatitlan to Mexico City.
Status: Planned.
Completion: December 1962.
Project: 270 miles of 8-in. from Torreon to Chihuahua.
Status: Under way.
Completion: February 1962.

PIPELINES OF PUERTO RICO, San Juan.
Project: 95 miles 8-in. from Penuelas to Catano.
Status: Approved by PSC.

SYRIAN PIPELINE.
Project: About 310 miles from Homs to tank farms in the Damascus, Aleppo, and Latakia areas.

UNION OF SOVIET SOCIALIST REPUBLICS.
Project: 2,315 miles of 29-in. Trans-Siberian crude-products line from Ufa and Tuimazy fields in Bashira to Irkutsk.
Status: Under way.
Project: 700 miles from Novo-Kuibyshev refinery to Bryansk.
Status: Under way.

YACIMIENTOS PETROLIFEROS FISCIALES (Argentina), Buenos Aires.
Project: 652 miles of 10-in. from Lujan de Cuyo to Buenos Aires.
Status: Planned.

Foreign Natural Gas Pipelines

BASRAH PETROLEUM CO., LTD., 214 Oxford St., Oxford Circus, London W. 1, England.

GASES NATURALES DE COLOMBIA, S.A. (Owned 50% by Colombian Petroleum Co., is affiliated with Mobil International and Texaco, and 50% local.)
Project: 140 miles of 10-in. from Cicuo field to Barranquilla.
Completion: Late 1961.

INTERNATIONAL GAS CO., Los Angeles, Calif.
Project: 1,840-mile, 30-in. gas line from Reynosa to Mexicali via Monterrey, Mazatlan, etc.
Status: Proposed.

ISRAEL GOVERNMENT and private interests.
Project: 75 miles of 16-in. to power a plant at Ashdod Yam on the Mediterranean coast.
Status: Planned.

NOGAS, Vienna, Austria.
Project: 82 miles of 8 and 10-in. to connect Traismauer and Amstetten in Austria.
Contractor: Williams Brothers, Tulsa.

PAKISTAN INDUSTRIAL DEVELOPMENT CORP.
Project: 1,000-mile system from Sui field to Lyallpur, Lahore, Daudkhel, Islamabad, Rawalpindi, and Wah. This would require a loop to an existing 310-mile 16-in. line from the Pakistan petroleum field to Multan.
Status: Proposed.

PAKISTAN PETROLEUM CO.
Project: 145 miles of 8-in. from Sylhet field to Daccq, East Pakistan.
Status: Proposed.

PETROLEOS MEXICANOS, Avenida Juarez 92-94, Mexico City, Mexico.
Project: 270 miles of 12-in. from Torreon to Chihuahua.
Status: Under way.
Completion: December 1961.

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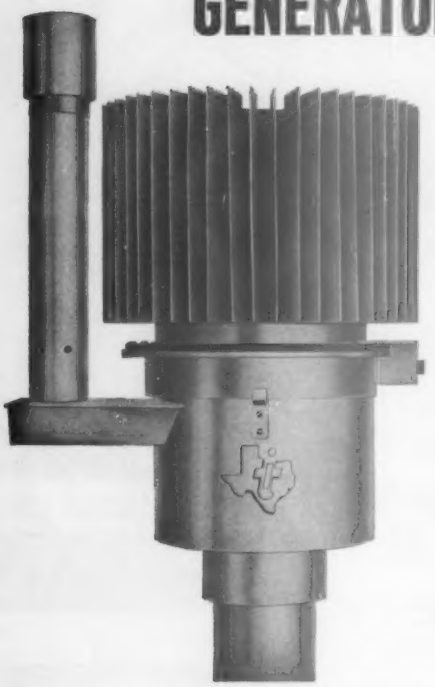

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Texas Instruments Thermoelectric Generators provide an economical, maintenance-free power source for a variety of unattended, remotely located equipment. This completely new design uses no moving parts and can be operated on natural gas, propane, butane or other combustible fuel . . . provides power where commercial service has never been available.

The TI Thermoelectric Generator is built to withstand full exposure to the elements . . . no housing or special enclosure is required. Long-term reliability is assured by ruggedized construction and simplicity of basic design. Installation and operation are easily handled by regular field personnel.

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PIPELINE CONSTRUCTION

SOC. SICILIANI METANDOTTI (SOSIM).
Partners include Edison Power, Italcementi, Fiat Motor, Sicilian SGES Power, Bombrini Parodi Delfino Chemical, and Montecatini.
Project: 560 miles from Hassi R'Mel gas field, Algeria, to Cape Bon, Tunisia, 77 miles across the Sicilian Channel, into northern Italy and beyond.
Status: Engineering studies under way.

STANDARD - VACUUM OIL CO., New York.
Project: 60 milts of 8-in. from Radja field to Palembang, Sumatra, to supply fertilizer plant planned by the government.
Status: Planned.

TEIKOKU OIL CO. and **TOKYO GAS CO.**
Project: 200-mile, 12-in. system from Kubiki gas field.
Status: Proposed.

TRINIDAD & TOBAGO ELECTRICITY COMMISSION, Port - of - Spain, Trinidad.
★ Project: 42-mile, 16-in. gas line from Penal fields to Port-or-Spain.
Status: Planned for 1962.

TENNESSEE GAS TRANSMISSION CO., Box 2511, Houston, Tex.
Project: 1,100-mile, 30-in. line from Reynosa, to San Luis Rio Colorado, near the California border.
Status: Pending FPC, California PUC approval.

UNION OF SOVIET SOCIALIST REPUBLICS.
Project: New line from gas fields in western Ukraine to the Polish border.
Status: USSR has signed agreement with Poland.
Project: 250-mile line from Ust-Vilyuisk field to the Siberian cities of Yakutsk and Pokrovsk, plus feeder lines to supply villages in the Lena River Valley.
Status: Planned.
Completion: Date not set yet.
Project: Two parallel, 40-in. lines, each over 1,300 miles long, from Gazli, near Bukhara, northward to Sverdlovsk and Chelyabinsk.
Status: Planned.
Project: From Tashkent to Chimkent, Dzhambul, Frunze and Alma-Ata near Chinese border.
Completion: By 1965.
Project: Line from Berezovo field southward to Sverdlovsk.
Status: Proposed.
Project: Line from Minsk northward to Baltic Sea area.
Completion: To Vilnius, Lithuania, in 1961; to Riga, Latvia, in 1962.
Project: Line from Minsk northeast to Leningrad.
Status: Proposed.
Project: 800-mile, 40-in. line from Krasnodar fields north of Caucasus Mountainsto Serpukhov, south of Moscow, via Rostov and Lugansk.
Status: Under way.
Project: 310 miles of 32-in. line ringing Moscow at radius of about 50 miles.
Status: Under way.
Completion: 1962.

YACIMIENTOS PETROLIFEROS FISCALES (Argentina), Buenos Aires.
Project: 1,050-mile line from Comodoro Rivadavia to Buenos Aires with a spur ta Plaza Huincul field in Neuquen Province. Line will be 26 in. to Plaza Huincul and 30 in. to Buenos Aires.
Status: Proposed.

What's NEW . . . in equipment

Control for drill-pipe unloading

The need for wet plugs when drill-stem tests are run can be done away with and the unloading of drill pipe can be controlled with a new safety valve, the maker says. The valve is expected to save considerable rig time by the elimination of the need for using wet plugs.

A full-opening type, the valve consists of a spring-activated flapper for closing and opening and a sleeve that keeps the flapper open until an operator activates it. The valve is mechanically set by manipulation of the pipe and by a pin and J-slot mechanism.

Where the possibility exists of trapping large amounts of fluid, the safety valves can be placed at intervals in the drill-pipe string. Reported to be positive in action, the valve has a bleedoff port that lets formation fluid safely discharge into slush pits away from the rig. Source: **Johnston Testers, Inc.,** Box 98, Houston 1, Tex., U.S.A.

●

Solventless epoxy coating

Applied by a two-pack cold-cured system, the solventless epoxy coating can be used to protect from chemical attack such equipment as tanks, pipelines, and exposed steel structures. Film thicknesses up to 20 mils can be obtained with one application. When it's applied in tanks, forced-air circulation isn't needed to remove solvent vapors since it uses no solvent. It can be put on by brush or spray. Source: **Lewis Berger (Great Britain), Ltd.,** Freshwater Rd., Chadwell Heath, Dagenham, Essex, England.

Want more facts about equipment or copies of product literature described in this issue?

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Described in OIL AND GAS JOURNAL-Issue of August 28, 1961

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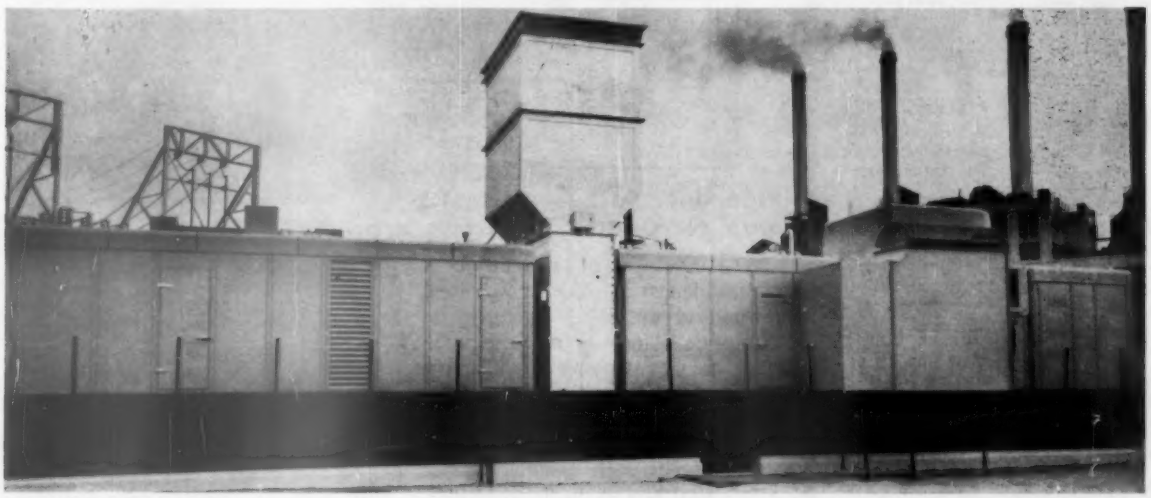

THIS 80-ft.-long, 22-ft.-wide unit can be shipped by rail in four major components.

Gas-turbine-driven packaged power plant delivers 11,250 kw.

USERS OF ELECTRIC POWER now have available a packaged unit that offers a rated 11,250 kw. of power, yet, when moved to a new location, only a small portion of the initial investment will be left behind. According to the manufacturer, less than 5% of the total cost of the power station will be expended for the site, and for labor and materials on the site.

In developing the power package, the designers used a building-block approach. Though considerable standardization is used, quite a bit of flexibility is still provided.

The plant is designed for remotely controlled, unattended operation, while retaining provisions for manned operation. The unit is completely self-cooled. Thus, no external cooling-water supply is needed. For industrial use, both a simple cycle and a regenerative-cycle arrangement of the package are available. Source: **General Electric Co.,** Schenectady 5, N. Y., U.S.A.

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Beam driven chemical injector

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Air or gas driven chemical injector

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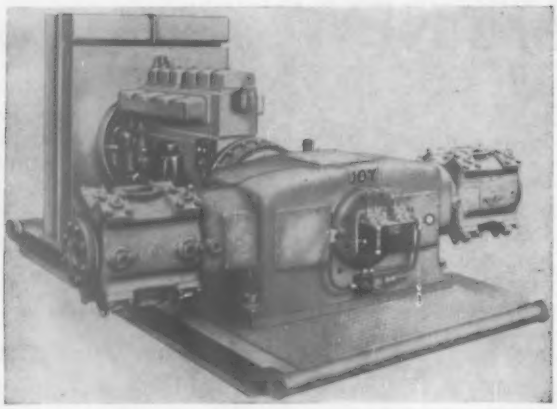
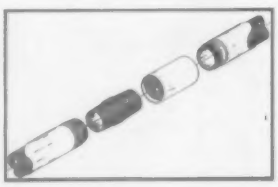


New gas-gathering compressor

This new packaged gas compressor is designed for direct connection to a natural-gas engine turning at 1,000 r.p.m. Its nominal horsepower range goes from 200 to 350 b.hp.

The package includes air-cooling equipment for the gas, water, and oil as required, scrubbers, knockout drums, surge chambers, pumps, traps, controls, and safety devices.

The unit is quite compact and portable. It can be installed on a slab, trailer, barge, or piling. Several cylinder sizes and pressure ratings are available. Source: **Joy Mfg. Co.,** Henry W. Oliver Bldg., Pittsburgh 22, Pa., U.S.A.



Pipe liner to stop corrosion

The developer of this new technique claims it offers a positive method to eliminate corrosion on the inside of new or used threaded flow-line pipe. Compared with presently available methods, the new method is reported to not only give a positive corrosion protection to the inside of each pipe length but also sealed protection to all fittings, including couplings, elbows, tees, and unions.

The liner is installed by doubling it and pulling it through the length of pipe. After this, it is inflated with air to force it to take the contour of the inside diameter of the pipe.

The liner is reported to be inert to all known chemicals and gases that flow along with crude oil, including aromatic hydrocarbons and isocompounds. Source: **Western Plastics Co.,** 500 W. Park Row, Arlington, Tex., U.S.A.

Pipeline plug injector

Either a soluable asphalt-base plug or a nonsoluable, brush type of scraper can be injected into a pipeline at pressures to 5,000 psi. with the injector, to clear accumulations of paraffin or sand from pipeline walls.

The product is designed with rubber seat sealing elements to seal effectively in high-pressure gas and distillate lines. Source: **Alco Products, Inc.,** Schenectady 5, N. Y., U.S.A.

•

New reforming catalyst

The catalyst, for platinum reforming, is reportedly a halide-free type. It's now being used and is claimed to be producing high yields of motor gasoline of the desired high octane number at relatively mild operating conditions and without addition of halogen compounds to the feed. Also

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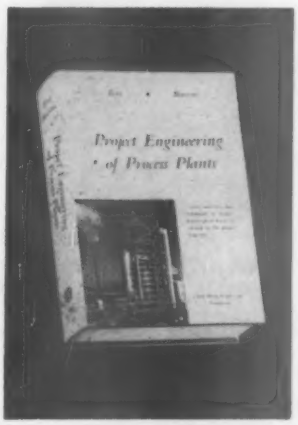

By Howard F. Rase and M. H. Barrow

**1957.
692 pages.
Illus.
$14.25.**

The first book on process plant design which formalizes the new profession of project engineering and is in accordance with modern techniques of project organization, planning, and execution.

THE OIL AND GAS JOURNAL
Reader Service Department
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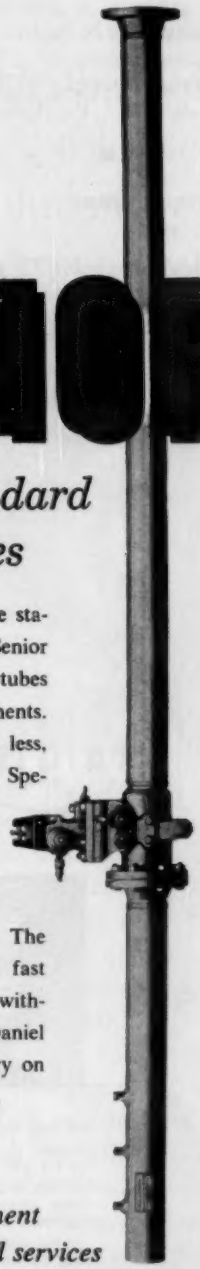
SENIOR
flangnek standard meter tubes



Used at sales and purchase stations everywhere, Daniel Senior "flangnek standard" meter tubes meet exacting service requirements. They are easy to order, cost less, and are available from stock. Special, factory-aligned upstream tubes combine with the Senior Orifice Fitting to provide a smooth approach to the orifice plate, free of offsets. The popular Senior fitting allows fast plate changing or inspection without line shut-down. See your Daniel representative for the full story on your best buy in meter tubes.

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hydrogen purity is at a high level.

The catalyst can be regenerated in place to restore activity. Source: **Houdry Process Corp.,** 1528 Walnut, Philadelphia 2, Pa., U.S.A.

•

TV camera goes in 3-in. pipe

With this pocket-size TV camera you can scan the inside of a 3-in. pipe and get a close-up view of what it's like. Called a Minicamera, it's only 9 in. long and less than 3 in. in

diameter.

The maker says it will operate without special protection in environments where there is a considerable amount of noise or vibration. Only the essential components are placed in the camera. The rest are housed in the control unit which is separate from the camera. The control unit can be placed where it's convenient, at some distance away. Source: **Fairbanks, Morse & Co.,** 100 Electra Lane, East Station, Yonkers, N. Y., U.S.A.

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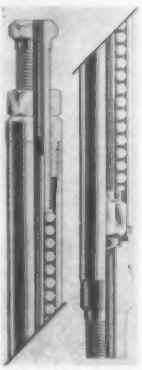
Help for paraffin problems



A new valve has been brought out that may be the answer for paraffin problems. Installed below the paraffin level in the tubing, the TPR-12 valve lets hot oil or solvents be pumped through the tubing and into the casing. The dissolved paraffin and the circulating fluid can then be lifted to the surface through the normal pumping process.

To resist wear, a satellite valve and a carbide valve seat are used. To resist corrosion the valve is constructed throughout with monel. Source: **Merla Tool Corp.,** Box 2576, Dallas, Tex., U.S.A.

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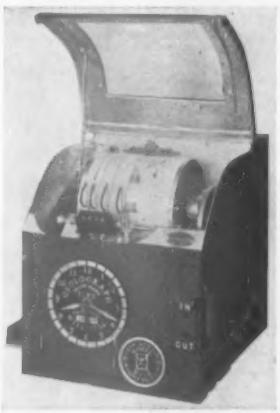

Four-pen drilling recorder

Five drilling variables are recorded by this instrument on a 7-in.-wide chart; penetration rate, downtime, rotary torque, pump pressure, and weight.

The Model G7TPW recorder furnishes this essential information for the driller in visual form. It gives him the relationship between these drilling variables and their influence on the penetration rate virtually at a glance. Source: **Geolograph Oil Field Service Co.,** P. O. Box 1276, Oklahoma City, Okla., U.S.A.

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'Hunt' a Better Deal in Oil Banking!
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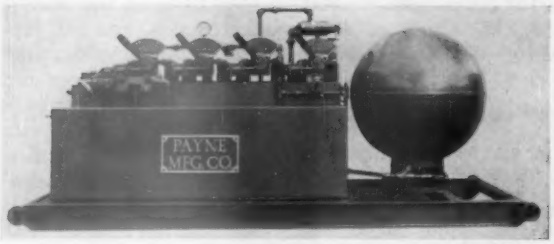
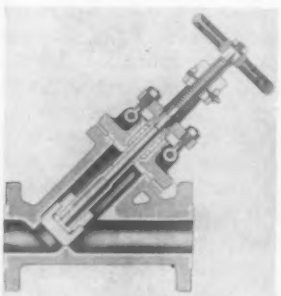


Compact accumulator for preventer

Two forged alloy-steel hemispheres are joined by one weld in this accumulator design. One 80-gal. vessel of this type reportedly can replace four tubular 20-gal. vessels.

In the new spherical nonseparator design, and the one automatic weld joining the two hemispheres makes a single 80-gal. accumulator.

Both the manufacture and tests, including X-rays, are to ASME specifications for unfired pressure vessels. Source: **Payne Mfg. Co., Inc.,** P. O. Box 9364, Houston 11, Tex., U.S.A.



Plastic-lined metal valve

The destructive effects of corrosive fluids are prevented from harming this Y-type valve as all wetted parts are protected by a heavy lining. Three plastic materials are available to match the fluid, pressure, and temperature conditions.

The valve comes in cast carbon steel and alloys in 1 to 3-in. sizes. Dimensions conform to ASA Standard B16.5 for 150 psi. Source: **Wm. Powell Co.,** 2525 Spring Grove Ave., Cincinnati 22, Ohio, U.S.A.

•

Waterproof field-repairable plug

A replaceable screw-in connection is featured in this new plug designed for use with signal circuits for offshore geophysical work, seismography in lakes and bays, and oceanography.

The plug detaches from the end of the wire and the two halves connect with the pin. The maker claims this feature makes it possible to repair the plug on the job in less than 4 minutes.

The plug comes with custom-sized rubber nipples to fit the cable it is to be used with. Source: **Vector Mfg. Co.,** 5616 Lawndale, Houston, Tex., U.S.A.

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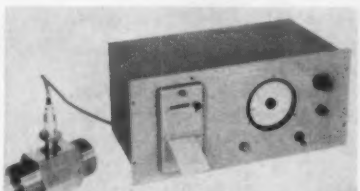

Meter with automatic printout

A flowmeter system now available not only totalizes the flow but produces a ticket in duplicate stating the quantity passed through the meter at flow rates up to 500 g.p.m. with a resolution of 1 gal.

Readings from the flowmeter feed into a rate - of - flow and totalizing unit equipped with the automatic printout counter. The electronic portion of the system is transistorized and can be operated with 24-volt batteries. Source: **Meterflow, Inc.,** Feltham, Middlesex, England.

Dowell
Paraffin Solvent
. . . a low-cost
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expensive problem

Dowell Red Paraffin Solvent is a non-chlorinated, oil-soluble material designed to dissolve paraffin accumulations . . . even when complicated by asphalt, salt, sand, gum or wax. Dowell solvent is chemically neutral. It contains no acid.

Dowell Red Paraffin Solvent weighs 10.4 pounds per gallon. It is often used at its full concentrated strength. However, it may be diluted easily with kerosene, gasoline, benzene or xylene to provide an effective, low-cost solvent for specific paraffin problems.

Dowell Paraffin Solvent is available at all Dowell stations and many oil field supply stores in convenient 10-gallon steel drums.

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DIVISION OF THE DOW CHEMICAL COMPANY

What's NEW

. . . in literature

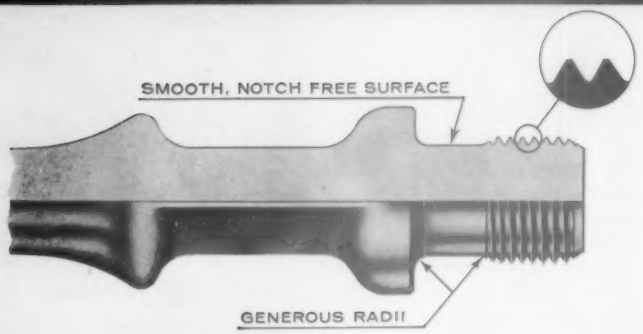
Pneumatic temperature transmitter

While detailing features of the Type 12A transmitter, the 12-page bulletin illustrates how easily the product can be installed and adjusted to suit a wide range of application requirements. Bulletin 13-17C gives detailed specifications, descriptions of operating principle, a table of temperature ranges, and data on related accessories. Source: **Foxboro Co.,** 86 Neponset Ave., Foxboro, Mass., U.S.A.

Catalog of corrosion tubing

This new catalog contains a wealth of data covering the physical and mechanical properties, installation procedures, supply data, and corrosion - resisting performance of virtually every type of solid metallic and solid plastic as well as coated and lined tubular products now or soon to be on the market. By using the catalog, you can flip to any of 300 corrosive media and determine precisely what types of effectively resistant tubular products are available in the required sizes, lengths, price ranges, etc. Included is a special supplement covering tanks and process vessels. Source: **M. L. Sheldon & Co., Inc.,** 350 Lexington Ave., New York 16, N. Y., U.S.A.

NEW! AT AXELSON-GARRETT



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DIVISION OF U. S. INDUSTRIES, INC.
"Products Designed to Give Oil a Lift" Sales Headquarters: Houston, Texas

68-page structure design manual

Newly revised, this manual presents a comprehensive story of a structural material said to be extremely adaptable, very flexible to design requirements, and containing a high strength-to-weight ratio. The manual is divided into several sections containing information on applications which show diversity of use; complete listing and description of all parts and components; the variety of materials in which Lindsay structure is available; thorough explanation of assembly method with illustrations; illustrated explanation of special applications; and a discussion of the technical aspects of Lindsay structure with test data in text, graph, and tabular forms. Source: **Lindsay Structure Div., International Steel Co.,** 1321 Edgar St., Evansville 7, Ind., U.S.A.

Metagraphic pneumatic receiver

The instrument, with a 4-in. chart width, is introduced in Bulletin A134, offered free to interested parties. Among features discussed are a removable chart-drive mechanism, a capillary inking system for trouble-free recording, and elimination of the "seal" position from the control function switch. Source: **Bristol Co.,** 117 Bristol Rd., Waterbury 20, Conn., U.S.A.

Plate and sheet work

This four-page literature piece presents plate and sheet work for refineries, petrochemical plants, and gasoline plants. Refining equipment offered includes distillation columns; scrubbers, drying towels, and absorption towers; processing vessels; steam extractors; vaporizers; tubular condensers; heat exchangers; cool-

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Package Unit Bulletin PSG-3 available on request

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SALES OFFICES: Camden, N. J., Charleston, W. Va., Chicago, Cleveland, Dallas, Los Angeles, New York, St. Louis.

ers; and reboilers. The bulletin illustrates a stabilizer and fractionating column, heat exchanger, vessel entering the furnace for stress relieving, and a battery of exchangers. Source: **Blanc - Misseron Div., Barbier, Benard & Turenne Co.,** 82 Rue Curial, Paris 19, France.

Orifice meters

Used for differential - pressure measurement, the Dri - flo meters, outlined in Bulletin 424, are designed for use where mercury is undesirable. The meters are available in indicating, recording, controlling, and telemetering models with working pressures from 1,000 to 5,000 psi., and differential ranges from 0-20 to 0-400 w.c. The bulletin provides specifications, descriptions, and engineering features of the various models. Source: **American Meter Co.,** 920 Payne Ave., Erie, Pa., U.S.A.

Mass spectrometer

Six-page bulletin 21130 describes the capabilities of the Type 21-130 laboratory mass spectrometer. The unit is a cycloidal focusing mass spectrometer using a cycloid tube with 1.1-in. focal distance and a permanent magnet charged to about 4,500 gauss. Unit resolution is attained at mass 200 with usable resolution to at least mass 230. Source: **Control Div., Consolidated Electrodynamics Corp.,** 360 Sierra Madre Villa, Pasadena, Calif., U.S.A.

Gas-analysis recorders

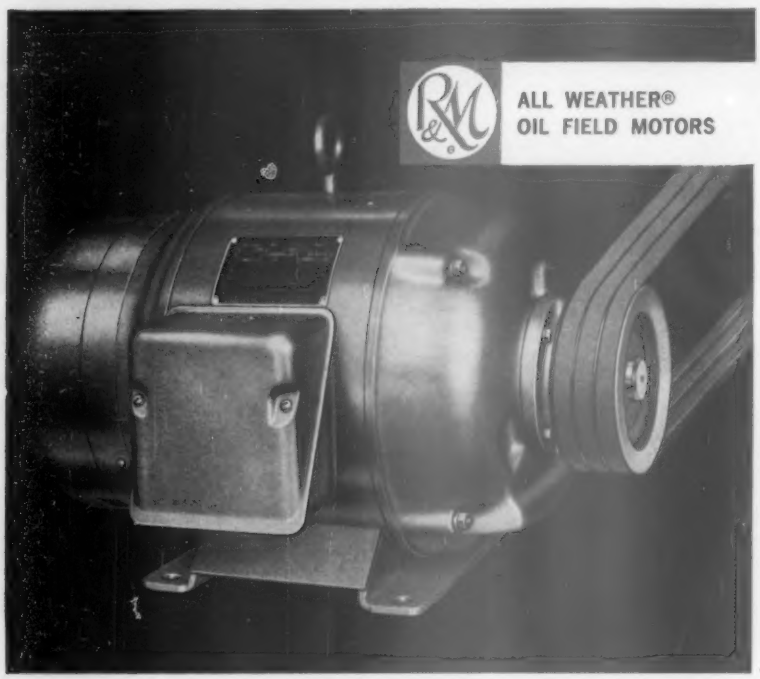
New catalog 163 illustrates and describes Mono gas-analysis recorders for two and three constituents. The eight-page catalog presents duplex and triplex recorders and gives data on installation and operation principles for each. Source: **James Gordon & Co., Ltd.,** Dalston Gardens, Stanmore, Middlesex, England.

Specialized oil-gaging equipment

Now being offered free to interested persons, new Catalog 31 contains data on tank-strapping tape and accessories and oil-gaging tape on a frame winder. One full page gives ordering information, including specifications for each of the products. Source: **John Rabone & Sons, Ltd.,** Hockley Abbey Works, Birmingham 18, England.

Latest drying agent

Kaiser DA-101 active alumina, as described in a new four-page literature piece, is an eta-type crystalline dehydrating agent in ball form. Composed principally of eta alumina, rather than the usual chi and gamma forms, the result is said to be a desiccant that is extremely adsorbent, chemically inert, with high crushing strength, good resistance to abrasion, and excellent thermal stability. The product should find with application as a desiccant in the chemical, petroleum, petrochemical, natural gas, and LP-gas industries. In the organic - chemical field, it can be used for drying ethylene, propylene, butylene, acetylene, and other chemicals. The bulletin offers data on shape, strength, capacity, purity, uses, and chemical and physical properties. Source: **Kaiser Refractories & Chemicals Div., Kaiser Aluminum & Chemical Sales, Inc.,** 3 Gateway Center, Pittsburgh, Pa., U.S.A.



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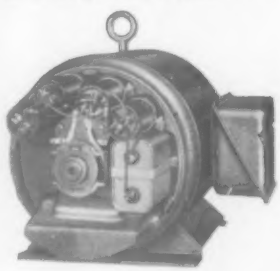

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▶▶▶ Equipment Men Notes

Otto Schwenk is new president . . . of Dover Corp., succeeding Fred D. Durham. Durham has been named chairman of the board and will continue as chief executive officer. Also, G. W. (Bill) Davidson, vice president in charge of sales

Schwenk

Davidson

for Dover's W. C. Norris division, has been elected executive vice president of the division. Davidson will continue to direct division sales, marketing, and research activities. Schwenk, the new president, was president of American-St. Gobain Corp. before joining Dover. He also was group vice president of Blaw-Knox Co., and vice president of Yale & Towne Manufacturing Co. at one time.

J. M. Hollingsworth will head spiral-weld sales . . . for Lone Star Steel Co. as manager of the company's new spiral-weld pipe sales department. Hollingsworth has been manager of cast iron pressure-pipe sales since 1957. Appointment of Hollingsworth is the first step in development of a distribution program for spiral-weld pipe. Facilities for manufacturing the pipe are now being installed at the company's East Texas mill and production is scheduled to begin in early fall.

Robert Fletcher promoted . . . to the newly created post of sales manager, industrial gas turbines, for AiResearch Manufacturing Co. Fletcher has been with AiResearch, a division of Garrett Corp., since 1959. His appointment is the second made by AiResearch in the gas turbine field during the past few months.

Fletcher

James T. Shore was previously named program manager of industrial gas turbines.

Two new appointments are announced by Worthington William T. Walker, project engineer, has been named product engineer, reciprocating-products, air-conditioning division. Hunt Davis, chief engineer, compressors, in the Harrison division, has been named director of fluid-machinery engineering in this division. He will be responsible for compressor and pump engineering at the Harrison, N. J., plant. Walker will headquarter in Decatur, Ala. He will be responsible for engineering coordination between the design group at company headquarters in East Orange, N. J., and manufacturing in Decatur.

Charles Kerby named manager . . . of the Harvey, La., pipe-coating plant of Plastic Applicators. The company operates three other pipe-coating plants in Houston, Odessa, Tex., and Morgan City, La. Kerby has been with the company since 1959.

Thomas Scannell named foreign operations director by Falk Scannell has been vice president and general sales manager. His new title is vice president and director of international operations. Don K. Lambert, manager of export sales for the corporation, will be director of international sales.

Scannell's duties as general sales manager will be taken over by Sands G. Falk, who has been named eastern division sales manager, and Kenneth O. Hood, who has been named western division sales manager.

Representative named in Denver . . . by Burgess-Manning Co. E. H. Parker, Parker Engineering Co., is the new sales-engineering representative for Colorado, Wyoming, and Utah. He will headquarter in Denver.

New Houston district manager . . . for U. S. Steel's Oil Well Supply division is Lawrence D. Kinnan. Kinnan has been Houston city representative for the division since 1959. He joined the company in 1933 and had served in Oklahoma City, Jennings, La., and Dallas, Alice, and Corpus Christi, Tex., before moving to Houston.

Southern Metallurgical moves . . . its Tulsa offices from 21 N. Cheyenne Ave. to a larger leased building at 1115 N. Utica Ave., according to Jack Burge, president. Additional machinery was installed in the new 4,000-sq.-ft. quarters. The firm provides a service for cleaning, grinding, and honing metal parts requiring an extremely fine finish. According to Burge, Southern Metallurgical is the only vapor blast and liquid honing machine shop in the nation, and includes sales and service for other wet blasting machines for finishing work.

Foreign affiliates organized . . . in Australia and France by Chicago Bridge & Iron Co., Chicago, in association with three foreign firms. The new companies are Chicago Bridge-Lennox (Pty.), Ltd., in Alexandria, Australia, and Chicago Bridge et Provence, at Arles-sur-Rhone, France.

Robert L. Hull, formerly of CB&I's international sales division, will be manager of the Australian firm. Co-managers of the French company will be Cecil A. Wooten, of CB&I, and Pierre Laval, head of Constructions Metalliques de Provence.

Partners in the French company include Constructions Metalliques de Provence, Arles-sur-Rhone, and Constructions Metalliques de Ardennes, Sedan.

Chicago Bridge-Lennox is jointly owned by CB&I and Australian Consolidated Industries. The company was formerly called Lennox Heavy Transport & Erection Co., and was a subsidiary of Australian Consolidated.

Continental-Emsco names two

. . . to sales posts in the Fibercast division. They are Phillip J. Liston, who has been named assistant sales manager in charge of special projects, and Marion F. Hutchison, who

Liston

Hutchison

has been named district sales manager in San Francisco. Hutchison will be responsible for northern California, Washington, and Oregon. Liston, who has been a district sales manager, will headquarter in Sand Springs, Okla.

Eleven men are named to new posts by Texas Instruments

The men and their new assignments are: Mark Shepherd, Jr., executive vice president responsible for operations; S. T. Harris, senior vice president in charge of corporate development; C. J. Thomsen, senior vice president responsible for financial activities and corporate communications; W. F. Joyce, senior vice president for the apparatus division; Cecil P. Dotson, vice president in charge of the new international division; James R. McDade, vice president in charge of the new transistor-products division; Jay Rodney Reese, vice president in charge of the new components division; Bryan F. Smith, vice president in charge of corporate relations, secretary and general counsel; and H. J. Wissemann, vice president in charge of the government-products group in the apparatus division.

George E. Livings has been named treasurer, and Guy W. Wilson has been named regional sales manager for the industrial-products group in charge of the Mid-America region, Chicago.

Bovaird to open new office

. . . in Jackson, Miss. Stanley J. Mead, district manager of the North Louisiana-Mississippi area, will move to Jackson from Natchez, Miss. Mead was store manager in Natchez before becoming district sales manager there last year. He has been with the company since 1947.

Robert P. Jones transferred

. . . to Oakite Products' New York headquarters office. He will do staff work for the company, reporting to John A. Carter, president. Jones has been New England division manager of Oakite since 1954. He will be succeeded in this post by Roger R. Heroux, Springfield, Mass., representative.

Chicago Pneumatic Tool Co. names Russell B. Miller

. . . general sales manager with headquarters in New York. Miller has been with the company 25 years. He has been manager of the Atlanta district since 1952. In the new post, Miller will be responsible for coordinating sales efforts behind the company's various products.

Dowell opens new station

. . . in Kilgore, Tex., to furnish oil and gas well stimulation and cementing services to East Texas operators. New services and equipment made it necessary to expand facilities in the area, the company said. Dowell has maintained an operating station in Kilgore since 1943.

The expansion includes a new equipment-maintenance building, a new warehouse, an addition to the present chemical warehouse, a new office building, and four new cement-storage silos with total capacity of 7,200 cu. ft.

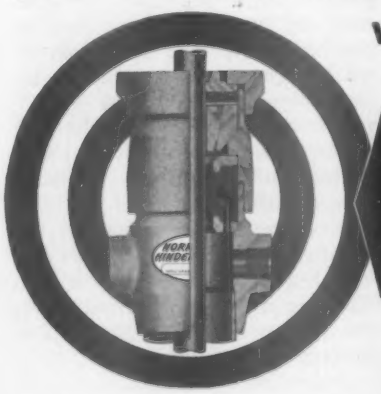
Kilgore operations are part of the Shreveport, La., district. C. L. Power is district manager, and H. E. Baker is in charge of Kilgore operations.

New division has been formed

. . . by Minneapolis-Honeywell with responsibility for the design and development of automatic programming systems for company computers, it was announced by the company's Electronic Data Processing Division. Walter W. Finke, EDP division president, said the new unit, to be known as the Programming Systems Division, will have equal status with EDP's marketing, engineering, and manufacturing divisions. Dr. Joseph H. Levin has been named director of the new division.

Kilby Steel expands sales staff

New appointments include: J. E. O'Brien, who will be inside sales and office manager in Houston; J. R. Lamp, who will be tubular sales representative in Dallas and West Texas; and R. D. Bartow, tubular sales representative for Tulsa and the surrounding area.



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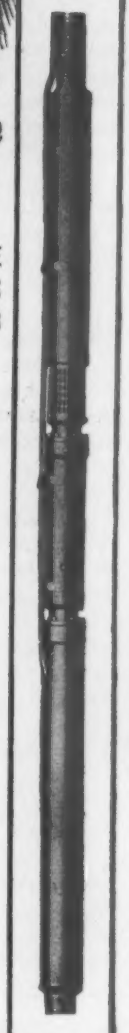

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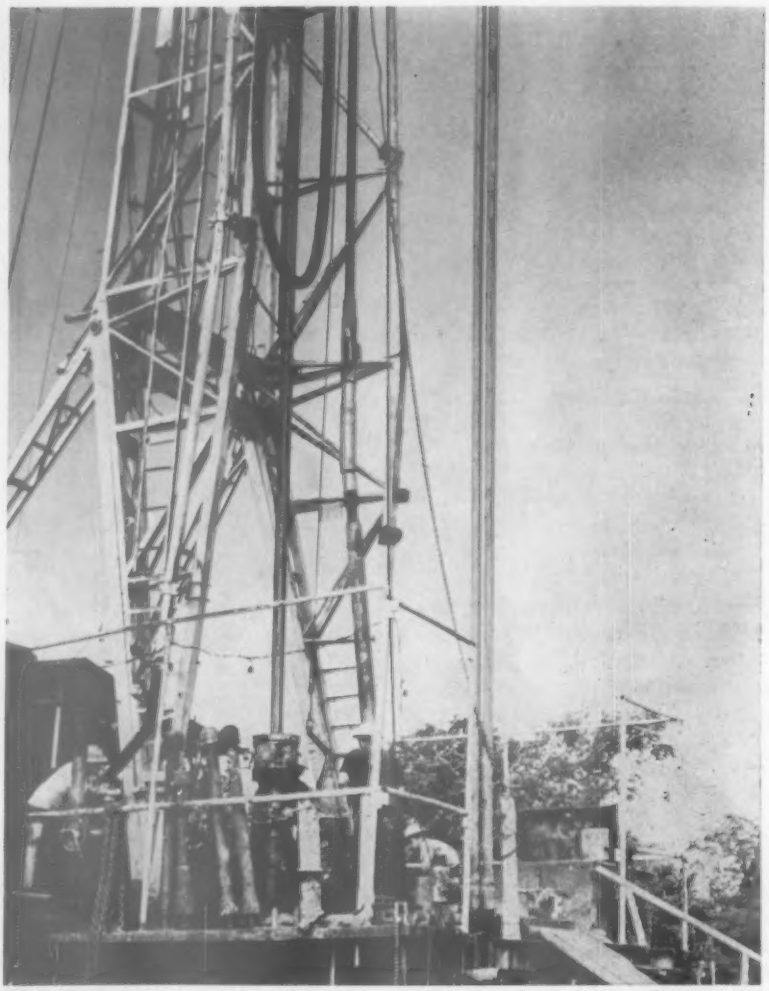

FIELD TESTS show that turbodrill can be used for directional drilling. Eastman Oil Well Survey Co., Denver, ran the tests in Texas.

Directional turbodrilled hole is success in Texas

A SUCCESSFUL run of a directional turbodrill hole has been completed in the U. S. by Eastman Oil Well Survey Co. of Denver. Based on the experience of its subsidiary in Germany, and extensive research, Eastman has developed a technique for using the turbodrill controlled by a specially designed deflection method.

The field tests now in progress are part of an evaluation program by Eastman to determine the economics of using the turbodrill for directional drilling as applied to domestic drilling conditions.

The test was conducted in connection with a planned directional program on a well in Texas. The total dog leg of 3¾° was equally distributed over the entire run of 40 ft. The tool was oriented by conventional methods. A picture taken in the middle of the run showed positive control of the turbodrill and the run was continued to successful completion. Drilling was both rapid and accurate.

After the course of the well was established with the turbodrill, a full-gage angle building hookup was run without the necessity of a hole opening trip.

According to the company, indi-

cations are that its technique of directional turbodrilling will have the advantages of introducing curvature uniformly to the hole instead of a sharp dog leg; use of full-gage bit which eliminates hole opening. The length of run can be such that normal amount of drill collars can be used on following run and that it can be used to clean out bridges or drill out fill, eliminating hole conditioning runs frequently required for other deflection tools.

Airborne rig to work Down Under

A NEW drilling derrick to Australia is to be used in the search for oil in South Australia and Queensland. It is now being assembled in Wingfield.

What's so different about this rig? Tagged the "helirig" it is designed so that it can be copter-lifted to inaccessible places like the jungles of New Guinea or steep mountain sides in a hitherto unequaled short time.

With a 131-ft. mast, the unit is now being readied by Oilsand Pty., Ltd. It is jointly owned by Oil Development N.L. and Santos, Ltd., and will soon be moved to a drilling site.

"When the assembly checkup at Wingfield is completed, it will be possible to erect the portable unit on location within 5 days instead of the usual 12 or more," claims J. A. Roche, Oilsand chief executive.

Oilsand's helirig will be conventionally moved to its first drill-site by road. The equipment is capable of reaching depths greater than 10,000 ft.

AAODC meet set

The twenty-first annual meeting of AAODC has been set for Houston October 4, 5, and 6 at the Rice Hotel. Housing information questionnaires have been sent to members along with preregistration forms and programs.

An all-function registration will cost $35 per member. This does not include the Ladies Banquet which is $10 each.

Deadline for advance registration mailing is September 20. Additional information can be obtained by contacting AAODC at 211 North Ervay, Room 505, Dallas 1.

"wherever oil men gather"

When oil men discuss the *"what, why* and *where"* of oil activity . . . the conversation eventually gets around to the *"how."* That's when you hear this oft-repeated phrase: "For my money, it's . . . THE FORT WORTH NATIONAL BANK."

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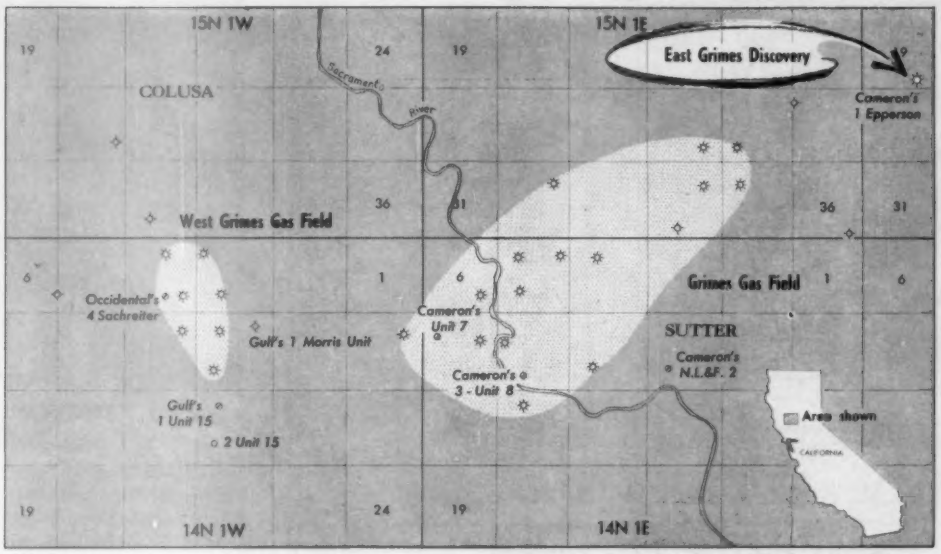


CALIFORNIA'S current exploratory hot spot is the Sacramento Valley where four gas fields have been opened since early 1960. Not shown on map is the fourth strike, 5 miles east of Grimes.

Grimes area gets its fourth field

BY CARL J. LAWRENCE
West Coast Editor

THE GRIMES gas area in Colusa and Sutter counties, California, has come up with another gas field, the fourth since January 1960.

Atlantic Oil Co., a Los Angeles independent, completed the discovery well in East Grimes field early this month. It is a dual-zone completion in the F zone Upper Cretaceous sands.

The discovery is 2½ miles east and slightly north of Grimes field. It is the twenty-third gas completion made in this area since Grimes was discovered in January of last year.

Several other operators are active in the Grimes play. Cameron Oil Co. and McElroy Ranch Co. are the principal operators in Grimes field. West Grimes is being developed by Occidental Petroleum Co. (which brought in the discovery well), Gulf Oil Corp., and Patrick A. Doheny, Los Angeles independent.

The area has been one of the hot spots in the Sacramento Valley gas play and is expected to see much more drilling. All wells are shut in awaiting a pipeline outlet.

... East Grimes. The discovery well, 1 Epperson, has 119 ft. of pay sand in the two zones. It flowed 7,000 M.c.f.d. from an upper zone at 5,800-58 ft. and 1,500 M.c.f.d. from 61 ft. of sand in four lower zones between 6,020-6,111 ft. Total depth was 7,150 ft.

The Epperson well, in 19-15n-2e of Sutter County, is separated from Grimes by two dry holes drilled by Atlantic. One went to 7,936 ft. and the other to 8,025 ft.

Atlantic is in the process of forming several units in the East Grimes area and is expected to drill several locations within the next few weeks.

Three companies hold properties offsetting the Atlantic acreage. These are Standard Oil Co. of California, Buttes Gas & Oil Co., and Cameron.

... Grimes field. Fifteen gas wells have been completed here and another 40 to 50 wells may be drilled in the field once it is fully developed on 160-acre spacing.

The two dry holes to the northeast have defined the field limits in this direction. A dry hole also has been drilled in 18-15n-1e as the most northerly hole in the field. There is a dry hole between Grimes and West Grimes, but none has been drilled in the southern part of the play.

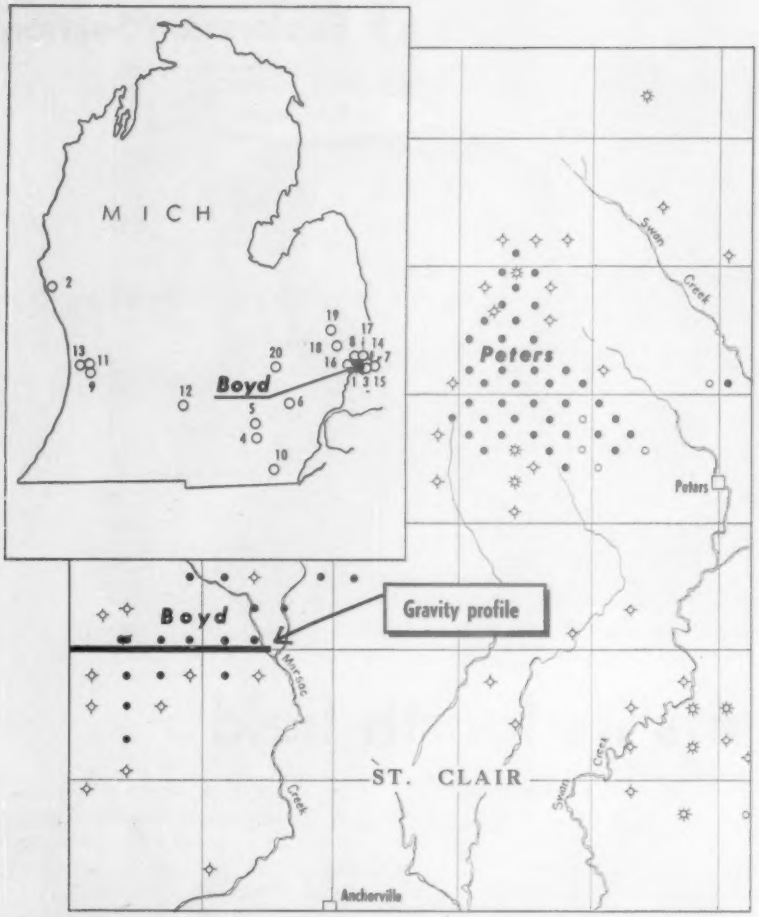
... West Grimes. Three recent dry holes took some of the edge off the early success in West Grimes. However, seven wells have been completed and Gulf is testing the most southerly well, the 1 Unit 15.

An eighth completion is expected at Occidental's 4 Sachreiter. The company is waiting on a smaller rig to complete the hole, which has had shows.

Probably the biggest disappointment in West Grimes was Gulf's 1 Morris unit in 10-14n-1w. The well is ¾ mile southeast of Gulf's 1 F. Stapp, which had an open-flow potential of 33,000 M.c.f.d. The 1 Morris unit went to 8,353 ft., but was plugged after a series of noncommercial tests.

Gulf is the only operator presently active in West Grimes. After completing the 1 Unit 15, the company plans to move south ½ mile to drill the second well on the unit.

A late development in the gas play in Sutter County (not on map) has resulted in another gas discovery. T. A. Atkinson's 1 Atlantic-Guisti in Section 17-14n-2e flowed at the rate of 5,500 M.c.f.d. during a 1-hour test from 6,260-6,310 ft. The discovery, not shown on the map, is 5 miles from production in Grimes field. (See p. 148 for details.)



THESE are the 20 Michigan reef fields that have been found by gravity meter. Fig. 1 (inset above). Boyd field was detailed by gravity meter and the gravity profile was run between good well control. Results of the survey were excellent. Fig. 2.

TABLE 1—MICHIGAN DISCOVERIES

	Pool name	Operator	Sec.	Twp.	Rge.	Year
1.	Boyd	Panhandle	31	4N	15E	1952
2.	Montague	Taggart	7	12N	17W	1953
3.	Ira	Panhandle	2	3N	15E	1953
4.	Clinton	Taggart	28	4S	4E	1953
5.	Freedom	Sun	8	3S	4E	1954
6.	Northville	Taggart	1	1S	7E	1954
7.	Marine City	Panhandle	10	3N	16E	1955
8.	Peters	Panhandle	22	4N	15E	1955
9.	Overisel	McClure	16	4N	14W	1956
10.	Summerfield	Bernhardt	30	7S	6E	1958
11.	Zeeland	Devine Long	29	5N	14W	1958
12.	Lee	Otterbine-McClure	12	1S	5W	1959
13.	Fillmore	Carter	34	5N	15W	1959
14.	China	Mills	31	4N	16E	1959
15.	Cottrellville	Panhandle	8	3N	16E	1959
16.	Lenox	Panhandle	32	4N	14E	1960
17.	Puttygut	Ferguson	11	4N	15E	1960
18.	Berlin	Sunray	33	6N	13E	1960
19.	Capac	Fain Porter	18	7N	13E	1961
20.	Unnamed	Goff	23	4N	6E	1961

Gravity meters uncover new reefs in Michigan

The author . . .

CRAIG FERRIS

. . . is a partner of E. V. McCollum & Co., Tulsa, and is vice president of Namco International, Inc., world-wide geophysical contracting firm. Ferris attended Friends University and later majored in physics at University of Oklahoma. Formerly he was with American Seismograph Co. from 1936-1938 and Mott-Smith Corp., 1938-1943. He and E. V. McCollum formed E. V. McCollum & Co. 18 years ago.

SINCE the discovery of the Boyd reef in 1952 (31-T4n-R15e, St. Clair County, Michigan), a total of 20 discoveries (Table 1) have been attributed to the gravity meter in Michigan.[1] The Boyd reef is shown by the square on Fig. 1. The other discoveries are shown by circles.

An "intense detail" gravity survey was made in the vicinity of Boyd and Peters fields in St. Clair, Mich. Fig. 2 shows the location of Boyd and Peters fields and the location of a gravity profile across the Boyd field.

Fig. 3 shows the (1) Bouguer gravity profile, (2) gamma ray-neutron well-log cross-section, and (3) Second Difference[2] gravity-interpretation profile as indicated by the arrows in Fig. 2. The well-log cross-section is for Panhandle Eastern Pipe Line Co. wells, permit Nos. (reading from west to east) 21803, 21744, 21282, 21705, 17717, and 22851 in 6-T3n-R15e. The gravity profile is along the section line north of the wells. Referring to the well-log cross-section, Well 21744 is 256 ft. high on the Niagaran with respect to Well 21803 on the west and it is 151 ft. high on the Niagaran with respect to Well 21282 on the east. The A-2 carbonate and A-2 evaporate sections show thin-

ning at Well 21744. The A-1 anhydrite and A-1 salt are absent in Well 21744.

The density contrast between the carbonate section and the salt is enough to cause measurable gravity anomalies. Fig. 4, "Attraction of Cylinder at Point on Axis" shows possible reefing conditions in Boyd field area where Niagaran is laid down on the Clinton shale. In Fig. 4, if we assume a cylinder or reef whose:

1. Radius is 2,500 ft.
2. Base is at 2,600 ft. (the approximate top of the Clinton shale).
3. Density contrast between the carbonate and salt is 0.4 g. per cc.

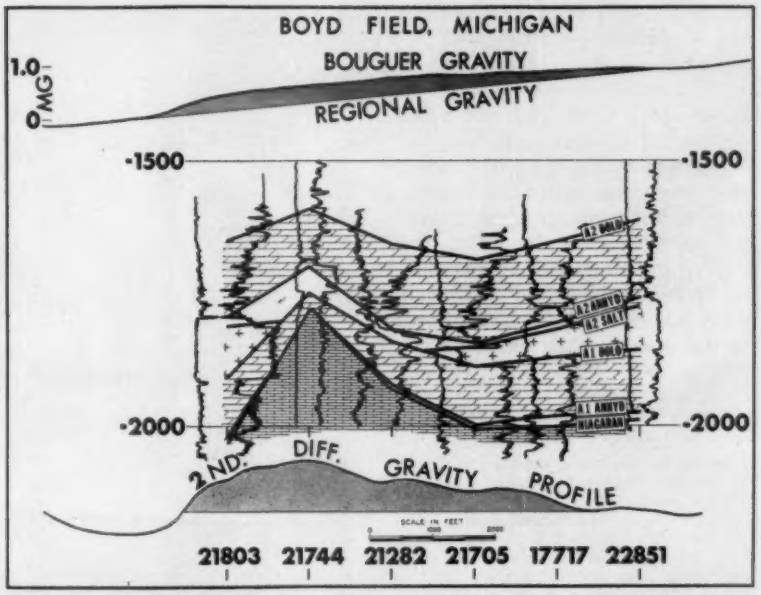
A carbon buildup of 200 ft. will give a resultant gravity anomaly of approximately 0.3 milligal. The gravity anomalies, in gravity units, are shown on the left side of Fig. 4 for density contrasts 0.2, 0.3, and 0.4.

It may be seen that the "measured" gravity anomaly shown by the gravity profile in Fig. 3 is reasonable and commensurate with the calculated anomaly as shown in Fig. 4. The "measured" gravity anomaly at Boyd field is slightly in excess of the "calculated" gravity anomaly. This excess may be explained, as pointed out by Ives and Ells,[3] as possibly due to (1) differential compaction, (2) regional deformation, (3) perhaps salt flowage in the more prominent salt beds which have resulted in structural closure in rocks overlying the larger reefs. Well 21744 as shown in the following table is high on all formations from the Mississippian-Antrim to the Silurian-Bass Island.

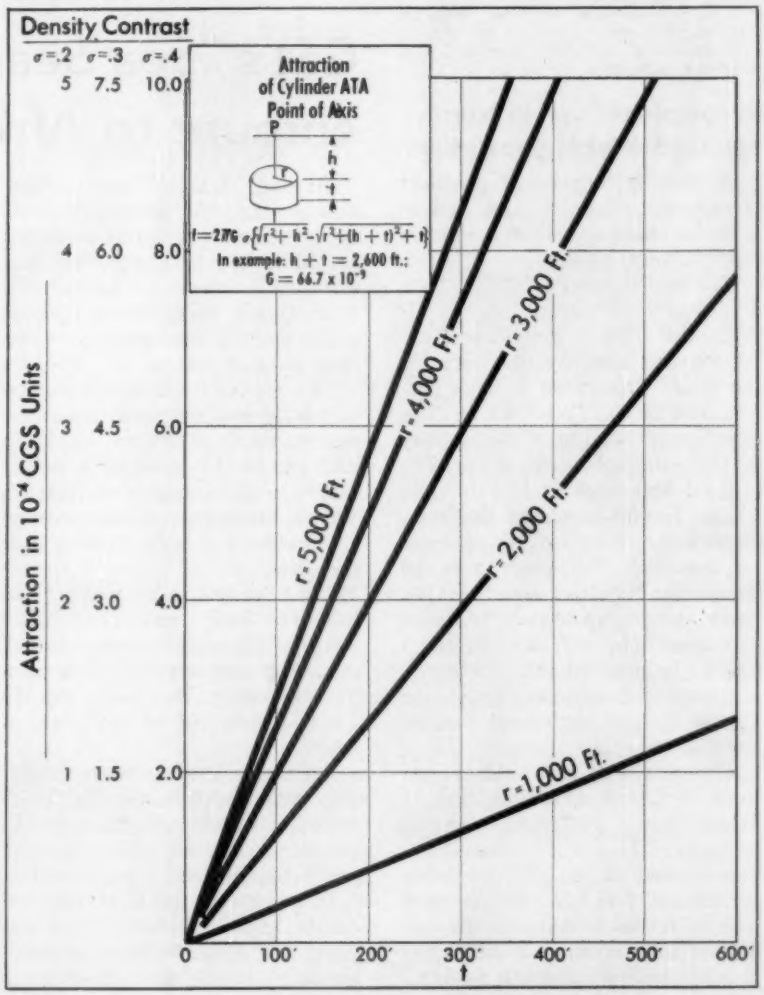
Formation—	Well 21803	Well 21744	Well 21282
Antrim-Mississippi .	+205	+230	+202
Traverse-Devonian .	− 20	+ 18	+ 14
Dundee	−219	−215	−221
Detroit River	−343	−340	−342
Bass Island-Silurian	−861	−827	−845

Although these structural closures are small, they all contribute to the gravity anomaly. No evidence is found of deformation at the base of the reef (in the top of the Clinton shale).

It is suggested that the high value on the Second-Difference gravity-



BOUGUER GRAVITY PROFILE, gamma ray-neutron well-log cross-section and Second Difference gravity-interpretation are shown across the Boyd field for comparison. Five-digit numbers at the bottom are well numbers of the line of section and are the Michigan permit numbers for the wells. Fig. 3.



IF A CYLINDER or reef whose radius is 2,500 ft., base is 2,600 ft., and density contrast between carbonate and salt is 0.4 g. per cc., a 200-ft. buildup will give an anomaly of 0.3 milligal. Fig. 4.

interpretation profile as shown in Fig. 3 (which coincides with the highest well—No. 21744—on the well-log cross-section) may be indicative of a "Pinnacle" reef which is a part of a larger reef mass.

Reconnaissance gravity surveys have been successful in locating reefs in Michigan. "Intense Detail" gravity surveys in the future will play an important part in pinpointing pinnacle reefs in Michigan. Many additional reefs will be found by the gravity meter in Michigan, Ontario, New York, Pennsylvania, Ohio, and Indiana.

Acknowledgment

Sincere appreciation is extended to George W. Straight, Panhandle Eastern Pipe Line Co., for release of the gamma ray-neutron well logs. E. A. Hutchinson, Sunray Mid-Continent Oil Co., and E. V. McCollum, E. V. McCollum & Co., contributed many worth-while ideas and constructive criticism during the formulation of the ideas for the text.

References

1. Bulletin of the AAPG, Developments in Michigan, 1952-1960.
2. E. V. McCollum, Geophysics, Page 63, Vol. 17, 1952.
3. Bulletin of the AAPG, Page 787, Vol. 45, No. 6, June 1961.

Recompleted well in North Louisiana makes good oiler

A flowing Smackover producer is reported at a reworked well in Colquitt field, Claiborne Parish, North Central Louisiana.

The well is Javelin Oil Co., Inc., 1 George W. Tigner, Jr., in NE NE 5-22n-6w. This is a southwest extension and new-pay discovery for the field. Production is from perforations at 10,279-10,348 ft. The well flowed 240 bbl. of 48°-gravity oil daily through ¼-in. choke. The original hole went to 10,510 ft. in 1958. Javelin reentered the hole, cleaned out to total depth, and ran log indicated 25-ft. porosity in the Smackover "C" zone and 12-ft. porosity in the Smackover "A" and "B" zones. The "A" and "B" zones haven't been tested yet. The operator ran 4½-in. production casing to 10,456 ft. and perforated for the completion.

This new well is ¾ mile southwest of Union Producing Co. 1 Tigner unit, 33-23n-6w, nearest production. That well produces from Taylor sand of the Cotton Valley Jurassic at 8,917-27 ft. This new well is across a fault on the upthrown side, opening a completely new reservoir for Colquitt field.

THIRD SHIP of Geophysical Service, Inc., Dallas, will engage in exploration effort off the coast of Spanish Sahara. The latest addition to the fleet will do extensive seismic investigations.

GSI's "Sea Search" enroute to Africa

THE "Sea Search," newest addition to the fleet of three ocean-going seismic exploration vessels owned by Geophysical Service, Inc., of Dallas, is currently under way on a 2,500-mile voyage from Trinidad to the Spanish Sahara on the northwest coast of Africa.

The vessel has recently completed a petroleum exploration contract in the Gulf of Paria off Trinidad and will perform a similar survey in the waters of the Spanish Sahara where interest in petroleum exploration has been growing over the past year.

The "Sea Search" is a sister ship to GSI's "Sonic" and "Texin." The Sonic is presently enroute through the Mediterranean Sea to a contract in the Persian Gulf and the Texin is working off the coast of Brazil.

All three vessels use the single-ship technique of marine seismic exploration wherein all phases of the seismic exploration program are performed aboard a single vessel.

In performing the single-ship operation, the seismometers are encased in a 2,700-ft. streamer which is towed behind the vessel at a speed of approximately 6 knots. Dynamite charges are automatically fired opposite the center section of the streamer each 2½ minutes. Impulses returning from geologic structures below the ocean floor are picked up by the seismometers, transmitted through the streamer to amplifiers aboard ship where they are magnetically recorded for later interpretation. Survey locations are plotted with radar and other electronic surveying devices.

As an aid to exploration in difficult areas where records are hard to obtain due to reverberations of the dynamite charge within the water layer, GSI offers a multiple-analyzer-eliminator data-processing service which virtually eliminates the reverberations. The processing permits GSI to work in many marine areas which were considered unworkable only a few years ago.

All three GSI vessels are ocean-going and can proceed to any marine area of interest under their own power, arriving ready for a prolonged survey. The "Sea Search" is 176 ft. in length and is registered at 676 tons. The "Sonic" is 158 ft. and 405 tons while the

"Texin" is 174 ft. and 420 tons. The three vessels have shallow drafts and can work close inshore. All three carry auxiliary launches equipped with seismic instruments and magnetic recording for work in shallower coastal waters and upriver networks. By using launches of this type it is also possible to tie the offshore marine work to land work being carried on in the same area.

Alberta wells tap Pekisko formation

In Alberta Consolidated Mic Mac Oils, Ltd., Edmonton, and Mobil Oil of Canada, Ltd., have encountered oil at neighboring tests of the Pekisko formation in the Twining district of Central Alberta about 50 miles northeast of Calgary.

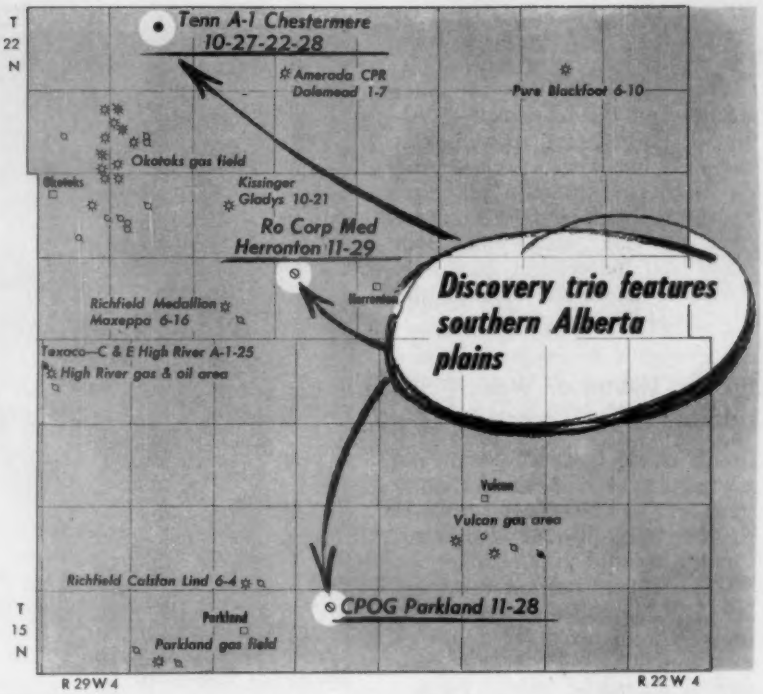
Both described as successes, the tests are Mic Mac 6-4 Twining (LSD 64-32-24 w4) and Mobil 16-34 Twining (LSD 16 34-31-24 w4) about 10-15 miles southeast of Wimborne (Leduc) oil field and about 16 miles northwest of gas production in Carbon field.

At latest reports the Mic Mac test, 1½ miles northwest of Mobil's test, was being completed in the Pekisko at a depth of approximately 5,450 ft. Recovery of 2,800 ft. of 30°-gravity crude has been reported from drill-stem testing.

The Mobil test appears to be a dual-zone success, having encountered natural gas in the Basal Quartz. On drill-stem test it flowed natural gas at a maximum rate of 2,060 M.c.f.d. The Basal Quartz was encountered at 5,209 ft. and net pay has been placed at 19 ft. The Pekisko, encountered at 5,311 ft. has net pay of 29 ft. On drill-stem test it gave a pipe recovery of 3,858 ft. of clean gassy oil and 150 ft. of oil-cut mud.

A drilling reservation favorably situated to these tests recently was purchased jointly by Mobil and Mic Mac for $337,137. It covers 8,140 acres.

The Pekisko formation may be in the news again as result of a test being drilled by Imperial Oil, Ltd., about 75 miles northwest of Edmonton. It is Imperial et al. 10-26 Lombell (LSD 10 26-59-9 w5). About 9 miles east of a Mississippian gas well, it is currently being held "tight" by Imperial.



THIS southern Alberta area has had three potential discoveries in the past few weeks. Map courtesy Daily Oil Bulletin.

Three fields open in Alberta

THREE potential discoveries are in the works for southern Alberta. The new field-openers include Tenneco Oil Co.'s Chestermere Lake area wildcat, Richfield Oil Corp.'s Herronton wildcat, and Canadian Pacific Oil & Gas, Ltd., Parkland district wildcat.

Further testing will be needed to determine the three wells' worth, but oil or gas completions are indicated at two of the wells. This is already a good oil and gas-producing area as shown on the map. Okotoks gas field in the northwest part of the area is the most active development area. Gas has been found commercially at High River, Parkland, Gladys Ridge, Mazeppa, and Vulcan. Oil shows were found at High River and Vulcan.

Chestermere. At Tenneco A-1 10-27 Chestermere on LSD 10, 27-22-28w4, drilling was stopped at 6,888 ft. and casing run to bottom. Drill-stem tests in the basal Blairmore gave 730 ft. of clean light-gravity oil with a gas output of 285 M.c.f.d. A thick section with good porosity was found here. Production tests are under way with results expected soon.

Herronton. Richfield Oil Corp. 11-29 Herronton, LSD 11, 29-19-26w4, bottomed at 7,993 ft. Good oil shows are being tested in the basal quartz and Turner Valley Mississippian.

Parkland. Canadian Pacific Oil & Gas Co., Ltd., 11-28 Parkland. LSD 11, 28-15-26w4, went to 8,520 ft. Shows were found in the Mississippian on a drill-stem test at 7,184 ft. Reports say 25 ft. of oil and gas pay were tapped here. Drill-stem test of the zone at 6,925-7,050 ft. gave 75 M.c.f.d. and more than 1,000 ft. of light condensate. Recent production tests have made between 45-48 bbl. of oil per day with a fairly high gas-oil ratio. Tests continue.

Michigan gets prospect

A new Trenton oil prospect was being watched by Michigan operators as Good and Good 1 Beal, NE NW SW 3-8s-1e, Medina Township, Lenawee County, showed 350 ft.

oil and 250 M.c.f.d. of gas at 2,900-8 ft., present test depth. Trenton section was called at 2,805 ft.

Prospect is located 18 miles southeast of the south end of Albion-Scipio field, and about 5 miles east of a line wildcat well, Prairie du Chien pay, drilled a year ago. Location is only 6 miles north of Michigan - Ohio state line. Both major and independent land men started to check the area on the strength of the show.

Prolific Lisbon oil well added to Utah's score

One of the best wells yet in the Lisbon play in southeastern Utah is Pure Oil Co. 1 Northwest Lisbon-H in NE SE 9-30s-24e, San Juan County.

The well was completed flowing 2,732 bbl. per day on a 6-hour test. Flow is from two lines, one with 48/64-in. choke and the other through 28/64-in. choke. Production is from the Mississippian at 8,514-8,682 ft. Location is in the western part of the field with production to the south and northwest.

Shell plans offshore Texas wildcat on Block 160

Location was announced for a Shell Oil Co. wildcat 28 miles southeast of High Island, Tex., in the Gulf of Mexico. The well will be 2 Federal Block 160, OCS-0743, off Jefferson County.

The No. 1 well here in Block 160 was completed in June as a new gas-condensate discovery from perforations at 8,464-69 and 8,444-49 ft. It flowed 43,500 M.c.f.d. from 8,400-ft. Miocene sand.

Minnelusa Pennsylvanian well in Wyoming's Crook County tested

The Powder River basin gained another Minnelusa producer at Davis Oil Co. 1 Federal-Schuricht, SW NE 11-52n-68w, Crook County. This new Pennsylvanian well pumped 292 bbl. of oil in 15 hours on pump test. Perforations are at 6,782-91 and 6,798-6,804 ft.

Tests continue at this discovery well which is 5 miles north of nearest Minnelusa oil at Mellott Ranch field.

A **LEFLORE COUNTY** wildcat, Humble Oil & Refining Co. 1 Burris, 2 miles north of Cartersville pool, flowed 1 M.M.c.f.d. on tests of the Spiro at 6,208-19 ft. Staff photo.

Oklahoma well taps Spiro pay

SPIRO gas production is reported at Humble Oil & Refining Co.'s 1 Burris wildcat in LeFlore County, 2 miles north of Cartersville field.

The well flowed 1 M.M.c.f.d. from perforations at 6,208-19 ft. Chris Well Service Co. of Oklahoma City is contractor on the wildcat. It is located on a 640-acre unit in the Arkoma basin of southeastern Oklahoma. Proposed depth was 6,000 ft. to Cromwell sands.

Arkoma basin. Across the line in the southeastern corner of Latimer, Midwest Oil Corp. 1 Maxey, NW SE NW 10-6n-22e, Norris Deep field, flowed 5,300 M.c.f.d. from Red Oak perforations at 7,000 and 7,151 ft. and 1,520 M.c.f.d. from Spiro at 11,397-11,406 ft. These are absolute open-flow gages.

Sinclair Oil & Gas Co. 1 Guthrie unit, NW NE SW 1-7n-19e, South Lewisville field, Haskell County, flowed 550 M.c.f.d. during test of the Cromwell at 6,283 ft.

Ohio's Fairfield County play adds another oiler

In Ohio, another field development well has been reported as successful in the expanding oil play in Richland Township, Fairfield County.

Glen Turm 1 George Wires, Section 9, made 220 bbl. of oil in a 24-hour test 5 days after fracture. The Clinton sand was found at 2,537-61 ft. Gas flow was estimated as 200 M.c.f.d.

Kingfisher play picks up another oil discovery

A new oil pool was tapped in Oklahoma's Kingfisher County. The discovery well is Powell Briscoe Inc. 1 Vaverka in C NE NE 30-19n-5w, 1½ miles north of Southeast Hennessey field.

The well flowed 15 bbl. of oil per hour and 500 M.c.f.d. from Meramec Mississippian open hole at 6,428-6,545 ft. Later it tested 180 bbl. through 21/64-in. choke per day.

A second producing zone was opened on the northwest side of North Homestead field in Major County, northwestern Oklahoma. The well is Pan American Petroleum Corp. 1 Brown-H in C NW SE 19-20n-11w. From Chester Mississippian lime at 7,344-7,414 ft. the well flowed 10,732 M.c.f.d. The first zone tested was Cherokee Pennsylvanian at 7,215-19 ft. That zone made 1,250 M.c.f.d. on tests.

McClain County. Goff-Leeper Drilling Co. 1 Carroll, C SE NE 29-6n-3w, East Criner field, flowed 25 bbl. of oil per hour on test of the Bromide Ordovician sand at 9,861-94 ft.

Texaco Inc. completed 1 Baxter-Ewert in C NE SE 19-6n-3w, Northeast Criner field, flowing 222 bbl. of oil per day on ¼-in. choke from Hunton Siluro-Devonian open hole at 9,664-9,746 ft.

South Ohio to get explorers

THE BUCKEYE STATE will feel the brunt of a 25-wildcat-well program. It has been announced that Pike and Scioto counties in southern Ohio will be the locale for the tests which are on acreage held by Continental Oil Co. and will be drilled by H H & R Drilling Co. of Wichita Falls, Tex. The program will start within 3 weeks.

The Ohio Oil & Gas Association reported that activity during July was average as far as field work was concerned. During the month 111 new locations were staked, compared to 145 during the previous month. A year ago during July only 95 locations were made.

Locations previously staked were a total of 139, against 105 in June and 138 a year ago. Of 120 drilling tests, 16 were less than 2,000 ft. deep and the remainder were proposed for depths greater than 2,000 ft.

There were 97 completions in July, 125 in June while a year ago there were 118 ventures finished. The breakdown of classifications of the completed operations were 35 oil wells, 17 gas wells, 25 dry holes and 20 gas and oil wells. This is an over-all success ratio of 74.2%, which is notably healthy in any area.

Despite the new successes, the total oil yield on 24-hr. test potentials were down from June and up from a year ago this month. They were 2,453 bbl. in July compared to 3,297 bbl. in June and 1,082 bbl. in July last year. Gas yield was 21.2 M.M.c.f. compared to 44.1 M.M.c.f. a month ago and 42.2 M.M.c.f. in July 1960.

Five wells are drilling in Morrow County in North Central Ohio. There United Producing Co. opened a Cambrian-Trempealeau sand well. The new find is United 1 Meyers located in Sec. 33 of Canaan Township which gave up 200 bbl. of 40° oil at a pay from 2,918-76 ft.

Fairway field extended northeast in East Texas

Booming new Fairway field in East Texas moved ½ mile farther northeast in Henderson County. The well is Atlantic Refining Co.'s 1 Josie Evans Oil unit in the Jose Juan Martinez Survey, A-993, 4½ miles northeast of Poyner.

Completion was for 495 bbl. of 47.8°-gravity oil per day on 10/64-in. choke from James lime perforations at 9,830-9,938 ft. Nearest production is Atlantic 1 William E. Bruton, completed earlier this summer as a 2½-mile northwest extension.

Dual discovery completed in Nolan County, Texas

A dual Odom and Caddo lime oil discovery was completed 2 miles south of Herndon in Nolan County, West Central Texas. The well is J. R. Hatch 2 Zilla Collins in the northeast part of the county.

This was originally a Cambrian test. Flow was 130 bbl. of oil per day on 16/64-in. choke from Odom lime perforations at 5,747-55 ft. From Caddo lime perforations at 5,974-84 ft. it made 145 bbl. per day on ¼-in. choke. Location is in Section 39, Block 20, T&P Survey, 2 miles southwest of White Flat Multipay field and 2 miles northwest of Dora North Multipay field, both having Cambrian production. The new well is separated from the two above fields by failures.

Clearfork discovery completed in West Texas

Crockett County, West Texas, has a new Clearfork Permian discovery 14 miles northwest of Ozona. The well is Southland Royalty Co. et al. 1-23 University in Section 23, Block 31, University Lands Survey, 5¾ miles southeast of Todd-Multipay field.

The well flowed 192 bbl. of 34.4°-gravity oil in 19 hours through 14/64-in. choke from perforations at 3,410-20 ft. Gas-oil ratio is 430:1.

Schleicher County. Fortune Drilling Co. completed 1 Bill Whitehead in northeastern Schleicher County, 14 miles northeast of Fort McKavitt, flowing 152 bbl. of 39°-gravity oil per day on 14/64-in. choke. Production is from perforations in the Strawn Pennsylvanian lime at 4,727-32 ft. Location is in Section 25, Block H, GH&SA Survey. It is the northeast offset to 1-A Chaney, newly opened dual Strawn sand gas and Harkey sand oil discovery well.

New pay tapped at triple producer in Texas' Nolan

A new pay in the Cook sand was reported at a triple completion in E. A. field, Nolan County, West Central Texas. The well is Humble Oil & Refining Co. 6 R. R. Petty, 8 miles northwest of Hylton in the central part of the county.

The well flowed 86 bbl. of oil daily from Cook sand perforations at 3,750-59 ft. on 16/64-in. choke. It also flowed 66 bbl. per day on 16/64-in. choke from Cambrian perforations at 6,218-26 ft. and 173 bbl. daily on 12/64-in. choke from Dolomite perforations at 6,162-86 ft. Location is in Section 6, Block Z, T&P Survey.

Summer pickup boosts Illinois drilling

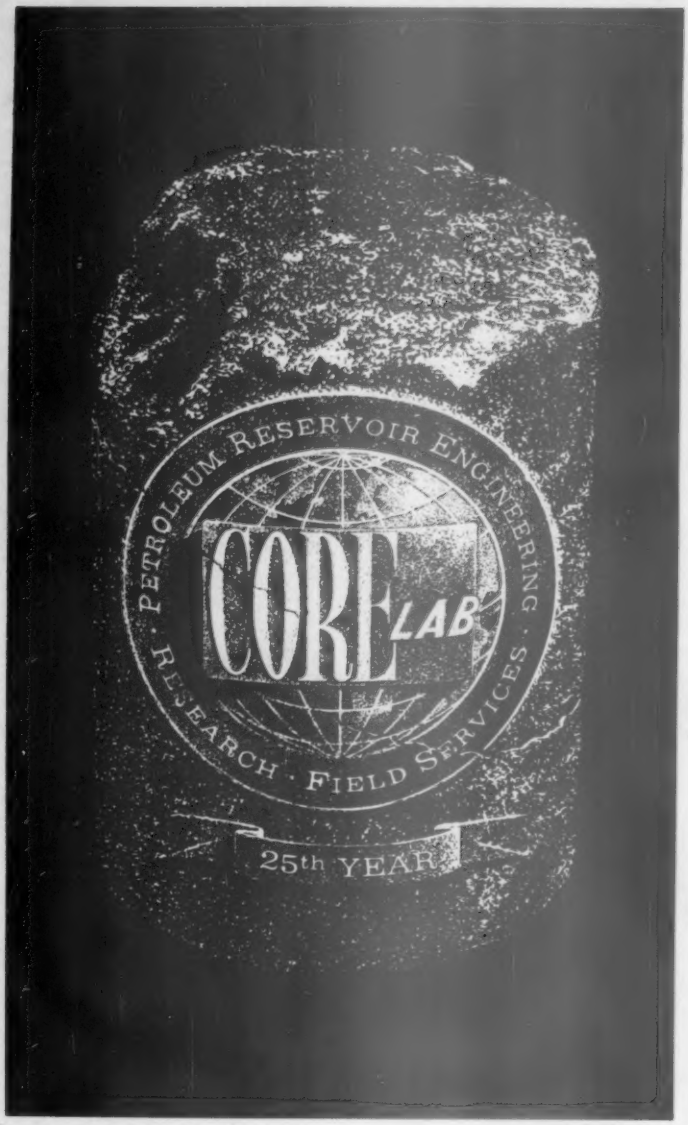
EXPLORATORY ACTIVITY is in the midst of the summer pickup in the Illinois basin. Development work is brisk throughout the three-state basin.

In White County, Illinois, E. F. Moran 1 G. Ingram, SW SW SE 17-4s-10e, flowed 175 bbl. of oil per day from O'Hara at 3,161-77 ft. This well is a ½-mile north extension to East Sumpter field, 3 miles west of Crossville.

In Richland County, Illinois, 2 miles southeast of Olney, R. K. Petroleum-Ashland Oil & Refining Co. 1 Kenneth Combs, SE SW NE 23-3n-10e, pumped 93 bbl. of oil natural in 14 hours from Rosiclare lime at 3,201-4 ft. It flowed 12 bbl. per hour for 12 hours, shut in at night, for 3 days before the well was killed and put on pump.

In Clinton County, Illinois, Beeson Oil Producers 1 Beckman, NE NW SE 8-1n-3w, recovered 200 ft. of clean oil, 100 ft. mud-mixed oil on a drill-stem test in the Silurian at 2,485-92 ft. Location is 5 miles northeast of Oakville and more than ¼ mile from production.

In Saline County, Illinois, Bufay Oil Co. 1 Sprich-Lorch, NW cor. NE 35-8s-6e, 3 miles northeast of Harrisburg, flowed 226 bbl. of oil



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per day from Waltersburg at 2,022-30 ft.

In Posey County, Indiana, H. Paul Maier 1 Amanta S. Maier, NE SW NW 28-7s-14w, pumped 100 bbl. daily with no water from Tar Springs sand at 2,110-30 ft. Location is 5 miles southwest of Mount Vernon.

In McLean County, Kentucky, Oeth Drilling Co. 2 Mrs. Frank Warren, 9-N-25, flowed 200 bbl. daily in the McClosky at 2,460 ft. This is a new pay discovery.

Frontier County, Nebraska gets its first completion

The first oil discovery for Nebraska's Frontier County was completed pumping 12 bbl. of oil and 12 bbl. water daily. It is Blair & Associates and Murfin Drilling Co. 1 Zimmer, C NW SW 33-6n-30w.

Production is from perforations at 4,230-40 ft. in the Pennsylvanian basal sand. It lies 7 miles north of Lansing-Kansas City Pennsylvanian production at Barger field, Red Willow County. It is more than 25 miles northwest of nearest pre-Pennsylvanian production at Sleepy Hollow field, also in Red Willow County.

Third well set for new West Colorado gas field

Location was staked for a third well in Wolf Creek unit gas field, northwestern Pitkin County, Colorado. California Co. will drill 3 Unit in NE NW 34-8s-90w, about 1 mile southwest of the discovery well which opened first production in the county.

Utex Exploration Co. 1 Wolf Creek unit, NE NW 26-8s-90w, the discovery well, flowed 3,380 M.c.f.d., natural from Cozette sandstone at 4,658-4,708 and 4,774-86 ft. It was completed earlier this year. The second well, California 2 unit in NW NE 23-8s-90w, was dry at 6,390 ft. This field is about 4 miles east of Divide Creek field of Mesa and Garfield counties.

Union Oil Co. opens Olympia office

Union Oil Co. will open an exploration office at Olympia, Washington this month.

The company since the first of

the year has acquired approximately 7,000 acres of offshore leases in the Ocean City area of Grays Harbor County. This land falls offshore from where Union in 1947 first found oil shows in the Miocene Nye or Blakeley formations. Subsequent wells by Union and others, including the 1957 discovery by Sunshine Mining Co., failed to develop commercial production.

Union recently received approval for unitization of approximately 5,000 acres of offshore land from the State Lands Commissioner. The unit agreement calls for a well to be drilled within the block by August 1, 1962. The Union acreage falls immediately south of some 7,000 acres held by Humble Oil & Refining Co. The Humble acreage was recently acquired on a farmout from Sunshine Mining Co. involving a total acreage package of some 25,000 acres of both onshore and offshore lands in Grays Harbor County.

Outer Continental Shelf exploration authorized off Oregon and Washington

The Department of Interior announced August 3, 1961, the approval of authorization of permits to conduct geological and geophysical exploration for oil on the outer Continental Shelf off Oregon and Washington.

Oil companies interested in exploratory work may now operate in federal waters upon these conditions:

1. Obtain a permit from the regional oil and gas supervisor, USGS, Los Angeles, Calif.

2. Operations shall be confined to such area or areas as designated in the permit.

3. A stipulation is filed with the regional supervisor to comply with requirements to protect and conserve the aquatic life in the designated area.

The USGS regional oil and gas supervisor has consulted with state authorities in Oregon and Washington and has arranged to use state inspection services for the protection of aquatic life.

Shell Oil Co. had previously applied for a permit to conduct geological and geophysical exploration on the outer Continental Shelf off Oregon and Washington.

Canada footage breakdown July 1961

	Field wells				Wildcats		
	Oil	Gas	Dry	Service	Oil	Gas	Dry
Western Canada	689,188	80,299	135,360	16,068	45,250	51,492	199,948
Alberta	509,686	68,418	81,011	16,068	38,501	42,562	165,042
Saskatchewan	175,102	2,285	52,264	.....	3,354	3,854	18,600
Manitoba	.....	.....	2,085	.....	3,395	.....	2,916
British Columbia	4,400	9,596	.....	.....	.....	5,076	.....
N. W. T.	.....	.....	.....	.....	.....	.....	13,390

Drilling jumps in New Mexico's Roosevelt County deep play

THERE IS a decided upswing in drilling activity in Roosevelt County, Southeast New Mexico. In the past 2 weeks eight new deep well locations were reported.

Nearburg & Ingram will try to confirm the newly opened Bough C oil production in Squyres field. The 1 Vincent, C S½ SW NE 10-7s-32e, ¼ mile north of the discovery well of the field, will go to 9,500 ft. or Devonian. The field's discovery well and only producer was originally a Pennsylvanian producer. It was reworked recently by Campana Petroleum Co., opening Bough C oil pay. The well flowed 264 bbl. per day.

Roden Oil Co. will drill 1 Federal Silver as a 9,700-ft. Bough C test in C SW SE 18-8s-36e. Location is 1 mile west of South Prairie Bough C oil field. Devonian oil will be the target for H. L. Brown & Clem E. George at the 1 H. P. Saunders estate, an 11,000-ft. wildcat in C SW NW 5-8s-37e. This try is 2½ miles north of Bough C oil production in Bluitt Allison field and 2 miles southwest of Wolfcamp gas at Bluitt Wolfcamp field. Forster Drilling Co. has contract for this one.

David Fasken will drill 1 Hughes Lopes in C SW NE 31-8s-38e, in the extreme southeast corner of Roosevelt County. This will be a confirmation try 1 mile southeast of recent Bough C oil discovery. That well, 1 Bernice M. Green, C NW SW 30-8s-38e, flowed 309 bbl. of oil per day at 9,451-55 ft. The east offset, 2 Green, was a failure.

In addition to the new wildcats slated for Roosevelt County, four field-well locations were staked. Coastal States 1 H. L. Harral will be drilled in 17-8s-36e, South Prairie field. At Allison, SDX 2 New Mexico State "AA" will be drilled in C NW NE 36-8s-36e. Ohio Oil Co. will drill 3 State in C NW SW 32-8s-37e. Sam Boren will drill 2 King Davis Federal in C NW NE 33-8s-37e.

Blinebry pay opened in Lea County, N. M. field

Blinebry pay was opened in Southeast New Mexico's Weir-Tubb field, Lea County. The well is Continental Oil Co.'s 10 Britt "B-15," a reentry. This was originally a Tubb zone well completed in 1960, but is now dually producing.

From Blinebry perforations at 5,782-5,802 ft. the well flowed 137 bbl. of oil per day on 17/64-in. choke. Location is in 15-20s-37e. Last year it flowed 756 bbl. of 37.5°-gravity oil daily from Tubb perforations at 6,430-6,534 ft.

N. M. symposium published

The Roswell Geological Society has published a symposium of the oil and gas fields of Southeast New Mexico. The symposium was first put out in 1956, but due to the growing interest and development in this corner of the state, the society decided a 1960 supplement to the original was needed. Virtually every member of the society and every company operating in the area has contributed to its publication. This supplement to the previous volume should be a major contribution to the literature of one of the country's hottest drilling arenas. This symposium supplement is well illustrated and very informative. It contains cross-sections, pipeline and field maps, stratigraphic sections, production and completion data, a listing of all oil and gas fields in the region, and discussions of various fields, trends, and other information. Order from Roswell Geological Society, Box 6732, Roswell, N. M.

Another gas discovery made in Grimes area of Sacramento Valley

ANOTHER gas discovery apparently has been made in the Grimes area of Sutter County, California.

T. A. Atkinson's 1 Atlantic Guisti flowed 5,500 M.c.f.d. during a 1-hour formation test at 6,260-6,310 ft. The operator is preparing to complete the wildcat after going to a total depth of 7,115 ft. Pay is in the Upper Cretaceous "F" zone.

The Atkinson well is in 17-14n-2e in the East Grimes area. It is about 6 miles south of another recent gas discovery, Atlantic Oil Co.'s 1 Epperson in 19-15n-2e. Both are east of Grimes gas field. The 1 Atlantic Guisti is 5 miles east of Grimes and the 1 Epperson 2¾ miles northeast. (See Exploration Highlights, Page 138.)

Discovery wells

NEW MEXICO

Lea County:

Sinclair Oil & Gas Co. 1 C. S. Stone, 15 miles south of Bronco in 22-15s-38e, 4½ miles southeast of Denton field. IPF 452 BOPD, 12/64-in. choke. 46°, GOR 684:1, TP 250 psi., CP packer, Devonian 12,740-52 ft. TD 12,848 ft. New oil discovery.

OHIO

Morrow County:

United Producing Co., Inc., 1 Orrie Myers, Canaan Twp., Sec. 33. IP 200 BOPD, IRP 1,123 psi., Clinton 1,118 ft., production at 2,918 ft. in Trempealeau Cambrian at 2,918 ft., Trenton-Black River 2,382 ft. TD 3,184 ft.

OKLAHOMA

Custer County:

Mobil Oil Co. 1 C. S. Dobbins unit, C SE NW 9-15n-15w, 2 miles northwest of West Crane field. IPF 436 BO and 4 BAWPD, 28/64-in. choke, FTP 350 psi., GOR 11,561:1, 44°, Oswego lime 9,800-09 ft. TD 14,405 ft. New oil discovery.

Ellis County:

Pan American Petroleum Corp. 1 Cully unit, 4½ miles south of Salon pool in C SW NE 33-22n-24w. IPF 158 BOPD, ¼-in. choke, FTP 425 psi., FCP 725 psi., GOR 1,446:1, 42°, Tonkawa and Morrow 6,456-59 and 8,880-82 ft.; IPOF 1,675 M.c.f.d., SITP 2,600 per 24 hours from Morrow. TD 9,450 ft. New gas discovery, dual completion.

Kingfisher County

Keener Oil Co. 1 Drummond W. Ratcliff, C SE NE 3-17n-5w, 2 miles northeast of Southeast Lincoln field. IPF 52 BO in 6 hours, 20/64-in. choke. TP 185 psi., 38°, flowing on time intermitter, SICP 640-psi. open-hole Meramec 6,505-94 ft. TD 6,594 ft. New oil discovery.

Slats Honeymon Drilling Co. 1 Wrobbel-Geis, 10 miles southwest of Kingfisher in SW NE 1-15n-9w. IPF 1,045 M.c.f.d., 20/64-in. Manning 8,770-8,800 ft. TD 9,283 ft. New gas discovery.

McClain County:

Petroleum Inc. et al. 1 Price unit, 1½ miles west of Washington field in C SW NW 18-7n-3w. IPF 192 BOPD, 20/64-in. choke, FTP 300, SITP 1.750, 42°, first Bromide sand 10,783-87 ft. TD 11,777 ft. PB 10,840 ft. New oil discovery.

Texas County:

Hugoton field, oil discovery in gas area. Shell Oil Co. 1-14 Honemann, C SW NE 14-4n-16eCM. IPF 427 BOPD, ½-in. choke, FTP 75 psi., 38°, upper Morrow 6,255-81 ft.

NORTH TEXAS

Archer County:

Jennifer Mississippian field. W. A. Lofton 1 I. R. Parkey "G" (Gulf), 13 miles southeast of Dundee in SPRR Sur. 2, A-1214. IPF 125 BOPD, 11/64-in. choke, TP 450 psi., CP 625 psi., 42°, GOR 350:1, Mississippian open hole 5,332 ft. TD 5,362 ft. New oil discovery.

Wise County:

Whitley B. Tidwell Strawn field. Bridwell Oil Co. 2 B. O. Whitley, 3 miles northwest of Bridgeport in John Frederick Sur., A-398. IPF 144 BOPD, 16/64-in. choke, TP 410 psi., CP packer, 41°, GOR 1,100:1, basal Tidwell Strawn 4,272-84 ft. TD 5,625 ft. New oil discovery.

SOUTH TEXAS

Goliad County:

Forrest C. Lattner 2 Ella Fimble, 8 miles northwest of Goliad in Jacob Fifer Sur., A-120. IPAOF 2,100 M.c.f.d., SICP psi., BHSIP 957 psi., dry gas, 2,100-ft. Frio sand 2,113-15 ft. TD 2,807 ft. New gas discovery.

Live Oak County:

Crow Drilling and Production Co. 1 W. A. Smith, 1 mile northwest of George West in Cameron CSL, A-145. IPAOF 3,300 M.c.f.d., SITP 2,642 psi., 62.4°, GLR 57,770:1, Slick 7,527-36 ft. TD 9,505 ft. Gas-condensate discovery.

Maverick County:

Halsell field. Union Producing Co. 29-1 Halsell, 23 miles southeast of Eagle Pass in Sec. 29, Blk. 11, I&GN Sur., A-970. IPF 276 BOPD plus 5% water, ¼-in. choke, TP 400 psi., 36.2°, GOR 687:1, Austin chalk 4,040-4,140 ft. New oil discovery.

Zavala County:

J. Paul Little 1 Emma Pryor Mangum, 2 miles southwest of La Pryor in Pedro Jose de Aguirre Grant, A-2. IPAOF 96 M.M.c.f.d., SITP 983 psi., dry gas, Olmos 2,120-32 ft. TD 3,145 ft. New gas discovery.

SOUTHWEST TEXAS

Nueces County:

Haynes and V. T. Drilling Co. 1 Herbert Bowers, 3 miles northwest of Bishop in Sec. 160, F. Z. Bishop Subd. of Weil Ranch. IPF 103 BOPD, no water, 10/64-in. choke, TP 525 psi., 40°, FOR 350:1. Frio 7,476-83 ft. TD 7,505 ft. New oil discovery.

TEXAS OFFSHORE

Jefferson County:

Blk. 160, Federal High Island (Don) area. Shell Oil Co. 1 Federal, Blk. 160, OCS-0743. IPAOF 43,500 M.c.f.d., SITP 3,380 psi., BHPSI 4,000 psi, GLR 274,-800:1, 47.4°, 8,400-ft. Miocene sand 8,464-69 and 8,444-49 ft. TD 12,889 ft. PB 8,469 ft. New gas-condensate field.

This Note has not been and is not being offered to the public.
This advertisement appears only as a matter of record.

NEW ISSUE

August 18, 1961

$20,000,000

Commonwealth Oil Refining Company, Inc.

5⅞% Promissory Note due August 1, 1976

Direct placement of the above Note was negotiated by the undersigned.

The First Boston Corporation

Investment Securities

NEW YORK BOSTON PITTSBURGH CHICAGO
PHILADELPHIA SAN FRANCISCO CLEVELAND

This electric winding and measuring machine is typical of the modern equipment National Supply uses to speed wire rope service. This store is at Corpus Christi, Texas.

YOUR BEST SOURCE FOR WIRE ROPE . . .
Union Wire Rope through National Supply Stores

Take the combination of Union wire rope *quality* and National Supply *service* and you can't find a smarter buy in the oil country.

Union Wire Rope specializes in high carbon wire rope. Union products are job-proved on the world's deepest wells under toughest operating conditions. Union specialists thoroughly understand oil country problems and make the products that serve you best.

National Supply stores carry complete stocks of Union wire rope products including *Tuffy* rotary lines, sand lines, cut rope and slings. Service is fast and dependable. And there are 115 of these stores located strategically to serve your needs. Like all the fine products available from National Supply, *Tuffy* wire rope products will give you longest service, greatest efficiency and safety.

No matter what your needs, from wire rope to complete drilling rigs, next time you buy, see National Supply.

See next pages for information on NEW B-275 ROTARY

New National Supply

rounds out complete line of rectangular design rotaries for drilling at any depth

The new B-275 rotary completes the full line of National Supply rectangular design rotary machines to meet every table opening requirement from 17½" to 27½". The full line is as modern as any major drilling equipment available today.

Here is the line-up of National rotaries, each capable of providing faster round trips and casing jobs:

SA-175 Designed for shallow to medium depth drilling. It has a 17½" table opening and 44" spacing. It is suitable for either portable rig hook-ups or standard mast and derrick installations.

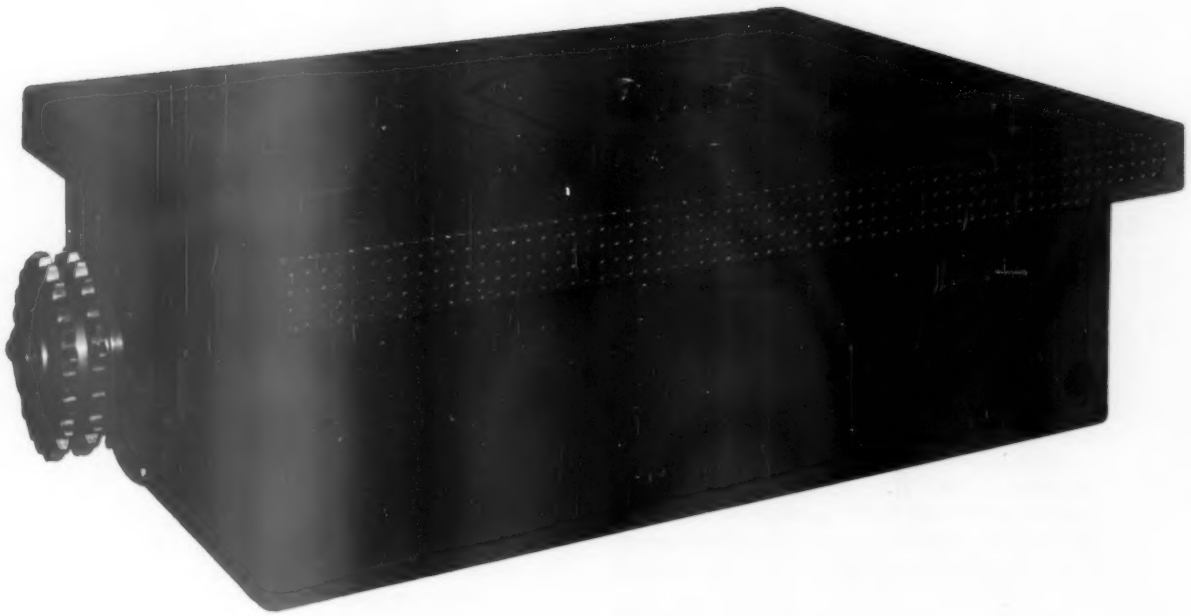
LA-175 Same capacity and size rotary, except that the LA-175 has a 53¼" spacing from center of the table to the sprocket.

A-205 Designed for medium and deep drilling and all standard rig-ups. It has a 20½" table opening and a standard A.P.I. 53¼" spacing.

B-275 This new rotary is designed for deep drilling. It has a 27½" table opening, with a 450 ton static load rating.

This is a National A-205 rotary installed in a National 80-B rig. Modern design features of the new square table National rotaries make them easy to install and maintain.

B-275 Rotary



☆ 450 Ton Static Load Rating
☆ 27½" Table Opening
☆ Easy to Install, Operate and Maintain

Rectangular Housing and Cover. Rig flooring can be flush-fitted to the table top for clean, safe working areas. Cover is fabricated of extra-heavy non-skid plate.

Matched and Lapped Spiral Bevel Pinion and Gear. Pinions and gears are perfectly matched at the factory and lapped for smooth, quiet operation. They are made from quenched and tempered alloy steel. Pinion teeth are flame hardened.

Unitized Gear Table Assembly. Main and hold-down bearings are unitized with the gear table and gear. This permits complete bearing adjustment before installation of the table assembly in the housing. The assembly is dynamically balanced and mounted on precision ball bearings.

Cartridge Pinion Shaft Assembly. Pinion shaft and bearings are enclosed in a cylindrical housing that assures accurate and permanent alignment of the bearings. The assembly is positioned for fast, easy servicing.

Selective, Direct Table Locks. Two independently operated racheting lock pawls are arranged to engage the slots in the rims of the gear. Each pawl locks the gear table in a different direction. Engagement of both pawls locks the table in both directions. Lock pawls are grease lubricated.

Pinion, Gear and All Bearings Are Oil Lubricated. The pinion and gear, pinion shaft bearings, ball bearing and the upthrust ring are all cascade lubricated from a large central reservoir. Oil is added at one easily accessible location.

It will pay you to investigate the many advantages of the National rotaries.
Ask your National Supply representative for complete details, or write to
National Supply Division, Armco Steel Corporation, Two Gateway Center, Pittsburgh 22, Pa.

Steel

Steel's Symbol of strength, long life, and economy

NATIONAL
Roller Kelly Bushings

assure smooth, friction-free movement of the kelly

All National roller kelly bushings provide operational advantages for smooth feeding of the kelly through the bushing. And they afford accurate weight readings.

They feature large rollers mounted on tapered roller bearings for minimum friction. All rollers are mounted in a single plane, with a separate roller for each kelly face. The simple, rugged construction permits individual roller lubrication. Generous compartment openings around the rollers provide natural cleaning and flushing areas. This simplifies cleaning and reduces mud accumulation.

You'll find it pays to specify National roller kelly bushings next time you buy.

National Roller Kelly Bushings are easy to clean and lubricate.

Solid, two-piece National Master Bushings reduce wear in deep drilling.

Conventional Table Bushings will fit any size National rotary.

NATIONAL
Table Bushings

reduce bushing and table wear

Traditional National Supply quality is built into National table bushings, which are available in conventional master bushings and in solid, two-piece bushings.

The split, or conventional, table bushing will fit any size National rotary. All driving and driven faces are flame hardened for longer wear.

The solid two piece master bushings will fit the A-205 and the new B-275 National rotaries. Upon application, these bushings can be installed in older model tables now in the field. The design of the solid two piece master bushings reduces wear, drill pipe distortion or gouging generally encountered in deeper drilling.

See your National Supply representative for details of National roller kelly bushings and table bushings. Or write to National Supply Division, Armco Steel Corporation, Two Gateway Center, Pittsburgh 22, Pennsylvania.

ARMCO National Supply Division

Wildcatters Put Down 730 Tests in July

	Total	Oil	Cond.	Gas	Dry	Footage	Cum. 1961	Cum. footage 1961
Alabama	0	0	0	0	0	0	7	76,219
Alaska	0	0	0	0	0	0	3	29,160
Arizona	1	0	0	0	1	6,515	8	22,904
Arkansas	5	0	0	0	5	24,103	56	221,942
California	20	0	0	1	19	145,318	155	982,440
Colorado	22	0	0	1	21	117,482	170	824,576
Florida	0	0	0	0	0	0	7	68,620
Georgia	0	0	0	0	0	0	1	4,500
Illinois	45	9	0	0	36	109,605	228	413,544
Indiana	16	3	0	0	13	21,344	108	137,034
Kansas	65	10	0	3	52	255,907	564	2,220,616
Kentucky	7	2	0	0	5	11,072	85	116,586
Louisiana	43	2	0	0	41	356,014	340	2,953,314
North	19	1	0	0	18	70,282	146	662,012
South	21	1	0	0	20	257,343	161	1,923,609
Offshore	3	0	0	0	3	28,389	33	367,693
Michigan	21	0	0	2	19	66,631	155	479,374
Mississippi	15	1	0	0	14	148,223	107	1,074,980
Missouri	5	0	0	0	5	8,212	26	46,037
Montana	17	0	0	0	17	63,681	102	552,173
Nebraska	54	5	0	0	49	248,242	276	1,289,666
Nevada	1	0	0	0	1	4,750	12	19,243
New Mexico	22	4	0	2	16	162,356	177	943,456
West	3	0	0	0	3	12,047	56	154,593
East	19	4	0	2	13	150,309	121	788,863
New York	5	0	0	0	5	14,564	12	38,630
North Dakota	8	0	0	0	8	49,723	40	272,113
Ohio	4	0	0	0	4	17,752	27	93,307
Oklahoma	26	3	0	5	18	113,167	344	1,807,746
Oregon	0	0	0	0	0	0	2	15,295
Pennsylvania	9	0	0	2	7	57,262	31	209,032
South Dakota	0	0	0	0	0	0	3	17,743
Tennessee	0	0	0	0	0	0	42	27,326
Texas	275	29	9	24	213	1,542,312	1,752	8,670,200
District 1	27	2	0	3	22	85,746	201	678,362
District 2	38	0	3	10	25	244,288	122	835,044
District 3	22	1	4	0	17	212,831	132	1,214,925
District 4	36	0	0	5	31	237,424	169	976,522
East (5 & 6)	27	2	2	1	22	159,488	177	859,634
District 7-B	28	3	0	3	22	94,742	294	1,033,448
West (7-C & 8)	64	16	0	1	47	352,522	452	2,119,130
District 9	26	5	0	0	21	102,045	151	559,994
District 10	7	0	0	1	6	53,226	54	393,141
Utah	14	1	0	2	11	71,975	68	379,923
Washington	0	0	0	0	0	0	7	25,715
West Virginia	1	0	0	0	1	6,136	5	39,506
Wisconsin	0	0	0	0	0	0	6	8,100
Wyoming	29	2	0	0	27	180,529	213	1,143,677
Total July 1961	730	71	9	42	608	3,802,875	5,139	25,224,697
Total June 1961	746	91	5	22	628	3,487,850	....	.....
Cumulative 1961	5,139	446	59	239	4,395	25,224,697	....	.....
Cumulative 1960	5,548	487	62	184	4,815	25,667,461	....	.....

TEXAS PANHANDLE

Lipscomb County:

Odessa Natural Gasoline Co. 1 Coline, 4 miles northwest of Follett in Sec. 78, Blk. 10, HT&B Sur. IPF 26 BO and 8 BWPD, ¾-in. choke, TP 25 psi., CP 175 psi., Cleveland 7,185-7,205 ft. TD 9,340 ft. PB 7,307 ft. New oil discovery.

Ochiltree County:

Shamrock Oil & Gas Corp. 1-B Helen D. Nabers, 20 miles southeast of Perryton in Sec. 383, Blk. 43, H&TC Sur. IPAOF 5,500 M.c.f.d., SITP 545 psi., upper Morrow sand 9,713-30 ft. TD 10,710 ft. New gas discovery.

Turner area. Shamrock 1 Pearl Turner et al., Sec. 303, Blk. 43, H&TC Sur. IPAOF 6,200 M.c.f.d., SITP 1,884 psi., upper Morrow sand 9,276-85 ft. TD 10,373 ft. New gas discovery.

Roberts County:

Texaco Inc. 1 R. A. Flowers, 10 miles northeast of Miami in Sec. 5, BS&F Sur. IPAOF 1,200 M.c.f.d., Wolfcamp 4,177-4,212 ft. TD 4,228 ft. PB 4,218 ft. New gas discovery.

WEST TEXAS

Coke County:

Tucker Drilling Co. I I. A. Bird, 10 miles northwest of Robert Lee in Sec. 469, Blk. 1-A, H&TC Sur. IPF 180 BOPD, 40.6°, GOR 766:1, TP 525, CP packer, Canyon sand 5,154-59 ft. TD 7,016 ft. New oil discovery.

Ector County:

Continental Oil Co. 1 H. S. Foster "A," 6 miles southwest of Odessa in Sec. 14, Blk. 43, T-3-S, T&P Sur. IPP 107 BOPD, plus 72% water, 32.4°, GOR 832:1, 4,660-4,746 ft. TD 4,800 ft. New oil discovery.

Garza County:

North Red Loflin field. General American Oil Co. of Texas 3 Koonsman "743," 12 miles west of Justiceburg in Sec. 743, Blk. 97, H&TC Sur. IPP 152 BOPD, 28.2°, GOR 250:1, Wolfcamp 6,042-48 ft. TD 8,338 ft. New oil discovery.

Scurry County:

Texaco Inc. 251 P. L. Fuller, Fuller field, 16 miles northeast of Snyder in Sec. 617, Blk. 97, H&TC Sur. IPP 88 BOPD plus 20% water, 42.8°, GOR 130:1, 4,935-37 ft. TD 7,360 ft. PB 4,939 ft. New oil discovery.

UTAH

Uintah County, Island unit:

Mountain Fuel Supply 2 Unit, NW NW 14-10s-18e. IPF 1,600 M.c.f.d., SITP 1,800 psi., SICP 1,800 psi. Wasatch 7,078-7,102 ft. Wasatch discovery, new field in Block B. TD 8,103 ft. PB 7,160 ft.

U. S. July Completions Rise to 3,912

	Total	Oil	Cond.	Gas	Dry	Service	Footage	Cum. wells 1961	Cum. footage 1961	Cable-tool comp.	D.D.
Alabama	1	1	0	0	0	0	11,509	31	344,001	0	0
Alaska	3	3	0	0	0	0	32,315	24	256,289	0	0
Arizona	1	0	0	0	1	0	6,515	13	28,704	0	0
Arkansas	35	12	0	1	21	1	140,708	288	1,078,344	0	1
California	130	89	0	4	35	2	579,446	941	4,214,451	0	6
Colorado	54	7	0	8	39	0	254,029	354	1,677,890	0	0
Florida	0	0	0	0	0	0	0	7	68,620	0	0
Georgia	0	0	0	0	0	0	0	1	4,500	0	0
Illinois	222	79	0	3	84	56	558,358	1,102	2,348,594	21	0
Indiana	60	19	0	0	39	2	86,606	382	537,331	20	0
Kansas	332	141	0	33	127	31	864,586	3,062	7,494,537	116	2
Kentucky	350	25	0	18	57	250	387,261	1,090	1,524,165	300	0
Louisiana	277	127	10	34	106	0	1,805,199	2,148	16,359,626	0	0
North	151	66	5	25	55	0	496,138	845	2,858,795	0	0
South	99	43	5	7	44	0	1,041,612	987	10,187,766	0	0
Offshore	27	18	0	2	7	0	267,449	316	3,313,065	0	0
Michigan	67	18	0	11	35	3	207,339	409	1,294,023	23	0
Mississippi	39	11	2	1	24	1	385,573	320	3,220,016	0	0
Missouri	5	0	0	0	5	0	8,212	27	47,431	0	0
Montana	34	15	0	0	19	0	164,067	214	1,160,854	0	0
Nebraska	93	33	0	1	59	0	420,527	583	2,632,691	0	0
Nevada	1	0	0	0	1	0	4,750	13	26,998	0	0
New Mexico	142	62	0	48	32	0	789,656	1,024	5,217,657	31	0
West	65	10	0	45	10	0	341,100	454	2,137,584	17	0
East	77	52	0	3	22	0	448,556	570	3,080,073	14	0
New York	121	75	0	3	7	36	172,377	301	431,833	121	0
North Dakota	28	14	0	0	14	0	172,269	154	943,652	0	0
Ohio	71	37	0	14	18	2	186,494	589	1,507,723	68	1
Oklahoma	375	213	8	26	101	27	1,171,822	3,439	11,050,179	92	5
Oregon	0	0	0	0	0	0	0	2	15,295	0	0
Pennsylvania	63	20	0	21	11	11	217,991	346	1,101,020	55	0
South Dakota	0	0	0	0	0	0	0	3	17,743	0	0
Tennessee	0	0	0	0	0	0	0	42	27,326	0	0
Texas	1,226	626	40	121	421	18	5,771,330	8,488	37,562,706	23	8
District 1	72	36	0	5	31	0	187,154	519	1,399,197	0	0
District 2	98	28	6	26	38	0	610,147	464	3,117,703	0	0
District 3	146	71	20	11	44	0	913,472	702	4,693,864	0	1
District 4	91	20	1	21	49	0	575,686	727	3,966,726	0	0
East (5 & 6)	100	49	4	8	39	0	582,625	731	3,650,817	0	0
District 7-B	98	42	2	13	41	0	340,277	1,087	3,268,964	4	0
West (7-C & 8)	290	194	1	19	75	1	1,499,940	2,080	10,506,048	13	6
District 9	250	147	3	0	83	17	669,197	1,476	3,775,420	6	1
District 10	81	39	3	18	21	0	392,832	702	3,183,967	0	0
Utah	22	5	0	4	13	0	122,359	150	856,405	0	0
Virginia	2	0	0	2	0	0	8,004	2	8,004	0	0
Washington	0	0	0	0	0	0	0	7	25,715	0	0
West Virginia	79	8	0	61	10	0	181,681	567	1,379,244	79	0
Wisconsin	0	0	0	0	0	0	0	6	8,100	0	0
Wyoming	79	35	0	3	39	2	413,378	561	2,854,882	0	3
Total July 1961	3,912	1,675	60	417	1,318	442	15,124,361	26,690	107,326,549	*949	26
Total June 1961	3,753	1,641	93	336	1,410	273	15,248,821	.....	.....	768	66
Cumulative 1961	26,690	11,942	562	2,642	9,588	1,956	107,326,549	.....	.....	*5,547	496
Cumulative 1960	25,497	11,756	758	2,063	9,893	1,027	108,897,881	.....	.....	.....	.....

*Estimated.

. . . and in Canada

	Total wells							Wildcats					
	Total	Oil	Gas	Dry	Service	Footage	1961 cum.	Total	Oil	Gas	Dry	Footage	1961 cum.
Western Canada	221	127	31	60	3	1,217,605	1,253	48	8	9	31	296,690	331
Alberta	147	79	26	39	3	921,288	835	37	6	7	24	246,105	227
Saskatchewan	65	46	2	17	0	255,459	310	6	1	1	4	25,808	37
Manitoba	3	1	0	2	0	8,396	14	2	1	0	1	6,311	3
British Columbia	4	1	3	0	0	19,072	79	1	0	1	0	5,076	49
Northwest Territories	2	0	0	2	0	13,390	15	2	0	0	2	13,390	15

M. R. J. Wyllie . . . sports car racer who went to Oxford.

Hasty Research Makes Waste

. . . says Gulf's M. R. J. Wyllie, scientist and champion racer—and an SPE distinguished lecturer this autumn.

DR. M. R. J. WYLLIE, who is a winning whiz in a sports car race, is against undue haste in petroleum research. That, in fact, is the theme of a speech he will make for the distinguished lecturer program of the AIME's Society of Petroleum Engineers.

Dr. Wyllie is director of the reservoir mechanics division of Gulf Research & Development Co. in Harmarville, Pa. He is also the only sports car racer with two doctorate degrees from Oxford.

A point Dr. Wyllie likes to stress in his talks about the petroleum industry is that too much research is "going off half-cocked without adequate theoretical understanding or laboratory investigation."

He contends that "too many novel schemes are put into practice in the field in the Micawberish hope that something useful will turn up."

He says, "The ethical process for the reservoir engineer is to test in the laboratory, and when the experiment works, is proven and positive, then to go out into the field.

"Field tests are extremely expensive and inherently involve many uncertain factors. There is no sense in increasing the uncertainties by not having sufficient background research at hand. Poorly designed and wasteful trials only put reservoir mechanics into disrepute."

Dr. Wyllie, 42, is a native South African. He was educated at the South African College School and the University of Cape Town. From Cape Town, where he was a third generation British South African, he went as a Rhodes scholar to Oxford.

From 1942 to 1946 he served in the Royal and South African navies in Europe and South East Asia, working on the development of secret weapons. At 25, he was one of the youngest lieutenant commanders in the British Navy.

In 1946, he was a post-doctoral fellow in chemistry at Johns Hopkins University. He joined Gulf's research laboratory in 1947.

A man of zestful interest in many fields, he has spoken over the BBC on Picasso, reads Tennyson, Keats and Shelley, propounds pet political theories on the confused outlook in Africa, and edited the college newspaper at Cape Town. During this latter "escapade," as he likes to regard it, he injected his love of polemics by writing fictitious letters to the editor and answering them "just to kick up dust."

But the dust he likes to kick up most is on the racetrack. He owned his first sports car as an undergraduate and started competing in South Africa in 1938.

This summer he competed before 300,000 spectators in the world-championship 24-hour race at Le Mans. A head gasket blew on his Lotus Elite after 20 hours and he had to withdraw.

At his farm near Dorseyville, Pa., he has 140 trophies and medals encased. But not all were won by him. His wife, Peggy, is also a racer, and a top-notch one, too. They met when she was studying for a doctorate in chemistry at Johns Hopkins.

Dr. Wyllie owns a Jaguar which he drives to work and a dark green and gold Lola-Climax, these being the South African colors. Although he has had several spills and crack-ups, he has suffered just one cracked rib.

Dr. Wyllie will represent Gulf and participate in the discussions on geothermal energy at the United Nations Conference on New Sources of Energy this month in Rome. But he hopes it may be possible to get in a little racing, too.

Dr. Wyllie's outlook on the future of oil recovery is one of cautious optimism. "No one can say what the political and economic atmosphere will be ten years from now. In reservoir mechanics we work for ultimate returns, not immediate. We aim to have the answers when the need arises."

He estimates that with the improved recovery processes of the future "it will be feasible to recover 85% of all the world's oil."

●

Noel Rietman, petroleum engineer with Shamrock Oil & Gas Corp., has been promoted to assistant chief production engineer in Amarillo, Tex. Rietman has been with Shamrock since 1957.

Personals

F. Hugh Wilson, foreign exploration planning coordinator for Tidewater Oil Co., has been named exploration manager of the foreign exploration and production division. He succeeds **Robert Dyk,** who recently resigned. Wilson joined Tidewater in 1940. He was western division exploration manager before being assigned to foreign exploration operations.

WILSON

George Howard, Shreveport, La., consultant, has joined Murphy Corp. in El Dorado, Ark., as staff geologist. Howard was with Georesearch, Inc., Humble, and Union Producing Co. before becoming a consultant.

Charles F. Darlington, former Middle East adviser to Mobil International, was named U. S. ambassador to the Republic of Gabon by President Kennedy last week. Darlington, who joined Mobil in 1946, served as the company's London representative for 7 years and held a number of Middle East posts. He left Mobil in June to become a consultant with the State Department.

Sinclair Oil & Gas Co. is combining its Houston and New Orleans divisions with headquarters in Houston. **T. F. Palmer,** vice president and Houston division manager, will head the combined operation. A new appointment for **R. A. Wright,** vice president and manager of the New Orleans division, is expected to be made within the next month. **O. G. Simpson,** assistant division manager in New Orleans, has been named assistant Houston division manager. In other changes for New Orleans personnel, **P. T. Ray,** division exploration superintendent, has been named district manager in Jackson, Miss. He succeeds **G. O. Davis,** who has been transferred to Denver. **J. M. Clevenger,** division production superintendent, has been named production superintendent for Sinclair Canada Oil Co. in Calgary. **C. C. Barber,** division geologist, has been named assistant Houston division geologist. **J. C. Knight,** division geophysicist, will be staff geophysicist in Houston, and **B. R. Roark,** division production engineer, will move to Denver.

Charles E. Morgenthaler, petroleum engineer for Tenneco Oil Co. in Oklahoma City, has been promoted to district engineer in Casper, Wyo.

Lee J. Thronson, formerly vice president in charge of operations for Oil & Gas Property Management, Inc., and Nafco Oil & Gas, Inc., has formed Parva Petroleum Co., new oil and gas property management firm, in Corpus Christi, Tex.

J. F. Walsh, Jr., Philadelphia area sales manager for Gulf, has been promoted to sales coordinator in the Syracuse division. **Kenneth P. Coe,** area sales manager in Collingswood, N. J., will succeed Walsh. **David M. H. Jones,** Philadelphia, will succeed Coe.

M. H. Arveson, coordinator of research for Amoco Chemicals Corp., will receive the 1961 Honor Scroll award of the Chicago chapter, American Institute of Chemists. The award will be presented October 5 in Chicago. Arveson has been with the Standard Oil Co. (Ind.) companies since 1924. He is a former chairman of the Chicago section of ACS, and is a national ACS director. In 1955, he received the Chicago Technical Societies Council's award of merit in recognition of service to science, technical societies, and the community.

Indiana Oil Purchasing Co. is consolidating its Wichita Falls, Tex., and Abilene, Tex., offices into a new office in Fort Worth. **W. S. Maxwell,** Abilene, will move to Fort Worth as district representative. **J. E. Damewood,** Wichita Falls, has been transferred to Casper, Wyo. He will succeed **R. L. Rasnic,** recently moved to Bismarck, N. D.

Tom K. Davis, vice president of Tennessee Gas Pipeline Co., Houston, has been elected president and a director of East Tennessee Natural Gas Co. He succeeds **John C. Bolinger, Jr.,** who will continue as an East Tennessee director. Bolinger is being promoted to a new post with Tennessee Gas Transmission Co., the parent company, in Houston. His new assignment will be announced later. Davis has been with the TGT companies since 1946. He became a vice president of Tennessee Gas Pipeline when it was organized in 1959. He will headquarter in Knoxville, Tenn., in the new assignment.

DAVIS

Hugh A. Smith, land agent with Pacific Northwest Pipeline Corp. in Boise, Idaho, has joined Montana-Dakota Utilities Co. in Glendive, Mont., as land agent.

Emerson H. Clark, Engineering-Construction Co., Tulsa, has been elected president of the new Distribution Pipeline Contractors Association. Other officers are **W. C. Donaldson,** Underground Constructors, Inc., Dodge Center, Minn., first vice president; **Arthur Everham,** Midwestern Contractors, Inc., Wheaton, Ill., second vice president; and **Don W. Miller,** Don W. Miller, Inc., Green Springs, Ohio, treasurer. Committee chairman will be **John Baker,** Engineering-Construction, Tulsa, membership, and **Deane Baker,** Ada, Mich., labor.

Sam A. Billington, petroleum engineer for Pan American Petroleum Corp. in Oklahoma City, has been named Liberal, Kans., district drilling foreman. He will be an assistant to **G. A. Younie,** district superintendent. The appointment is effective September 1.

Kerry Mills, technical adviser at American Oil Co.'s Texas City refinery, has been promoted to chief chemist there. He succeeds **John Grant,** who has been transferred to the Whiting, Ind., research and development department. Grant had held the Texas City post since 1958.

Bruce W. Watson, vice president of Canadian Homestead Oils, Ltd., has been elected executive vice president and a director. Watson is also vice president and a director of Ranchmen's Oils (1957), Ltd., and Palliser Petroleums, Ltd. He is manager of Castle Oil & Gas, Ltd.

E. V. Dobbins, chemist at American Oil Co.'s Casper, Wyo., refinery, has retired after 40 years with the company.

Thomas R. Barnes, exploration and production manager for Libya Shell, NV, in Tripoli, Libya, has been transferred to Midland, Tex., as staff geologist for Shell Oil Co.

Three British American Oil Co. officers have been named to the board of Shawinigan Chemicals, Ltd. They are: **E. D. Loughney,** B-A president; **D. L. Campbell,** executive vice president; and **J. W. Morgan,** vice president. British American recently acquired 25% interest in Shawinigan.

A. N. Earle, production engineer in Dow Chemical Co.'s Texas division, has been promoted to senior production engineer. **J. G. Broesche,** research engineer, has been named senior research engineer in the organic pilot-plant laboratory, and **D. L. Childress** has been promoted from research chemist to laboratory supervisor in the organic process-development laboratory.

Closing of Humble's Miles City, Mont., district exploration office and its merger into the Billings, Mont., district office, has been completed. **Earl Cockrum** has moved from Miles City to Billings as head of the geology department, and **James P. Duncan,** Miles City, has moved to Billings as head of the geophysics department. Others in the reorganized Billings exploration-production office are **John L. Cook,** district exploration manager; **R. D. Orr,** district production superintendent; **Guy Lookabaugh,** district engineer; and department heads, **Walter Sapp,** land; and **Myron Munson,** scouting.

Bob Halsey, engineer in the mechanical technical-service division of Humble's Bayway refinery, Linden, N. J., has been promoted to senior engineer.

Frank J. Stofac, staff engineer with British-American Oil Producing Co. in Denver, has been promoted to marketing engineer in Dallas.

M. M. Mulholland, supervisor of the stratigraphic section for Humble in Billings, Mont., has been transferred to Denver in the same capacity.

John W. Tynan, Rocky Mountain region production manager for Continental Oil Co., has been named southern region production manager. He will headquarter in Houston. He succeeds **E. A. Austin,** who will take over Tynan's old post in Denver.

Harry M. Howarth has been promoted to principal staff engineer in American Oil Co.'s general engineering department, Whiting, Ind. **Howard W. Olsen** has been promoted to senior staff engineer in general engineering, Whiting, and **Arthur J. Prohl** has been promoted to senior staff engineer in the refinery engineering division there.

J. A. Hapke, service division manager at the El Segundo, Calif., refinery of Standard Oil Co. of California, has been named managing director of a new company which will eventually become the operating company for a proposed fertilizer plant in Visakhapatnam, India. California Chemical Co., a California Standard subsidiary, is a minority stockholder in the Indian venture.

Russell G. Ernest, New York, has been named assistant manager of specialty-products planning in Humble's headquarters manufacturing department, Houston. **Charles B. Moore,** Baton Rouge, has moved to Houston as manager of fuel products and general planning in the manufacturing department. Ernest had been assistant manager of consumer sales in the Esso Standard eastern region. Moore was assistant head of the Baton Rouge refinery technical division.

▶▶▶ Personals

Henry H. Beeson, natural-gas coordinator for Mobil Oil Co. in Dallas, has been named head of a new natural-gas section in the exploration and producing department, New York. The new section will handle duties of the present natural-gas manager in New York and the natural-gas coordinating office in Dallas. **James R. January,** natural-gas manager for the Denver division, has been named market-development manager, a new position. He will also direct the company's activities with FPC. **C. R. Yarbrough** will move from New York to Denver as division gas manager.

BEESON

Bruce A. Landis, Jr., division unitization superintendent for Pan American Petroleum Corp. in Casper, Wyo., has been named North Texas-New Mexico division unitization superintendent. He will headquarter in Fort Worth.

R. A. Gerlicher has been named manager of Copolymer Rubber & Chemical Corp.'s new process-engineering department. **M. E. Samuels** has been named manager of the new product-quality department, and **J. D. Sutherland** has been named manager of the pilot-plants department, also a new unit.

E. H. Fallin, Jr., former technical and safety director for National Petroleum Association in Washington, has been named manager of the management-services department of National Petroleum Refiners Association with headquarters in Tulsa. **Pat R. Wrigley,** who directed public and industrial relations activities for Western Petroleum Refiners Association, will move from Tulsa to Washington in the same capacity for NPRA. The changes are part of NPRA's consolidation of technical activities in the Tulsa office and industrial and public relations activities in Washington. NPRA was formed July 1 by merger of NPA and WPRA.

Personals

Howard Kunsman, Tulsa consultant, has joined Falcon Seaboard Drilling Co. as chief geologist. He will headquarter in Tulsa. Kunsman has been a consulting geologist since 1944. He was a district geologist for the old Barnsdall Oil Co. before that time.

William N. Harris, petroleum engineer with Gulf Oil Corp. in Wichita Falls, Tex., has been promoted to production foreman and transferred to Winters, Tex.

George C. Cady, production engineer for Texaco in San Ardo, Calif., has been transferred to Bellaire, Tex., as test engineer in the production-research department.

Harry F. MacPhee, chief project manager for Catalytic Construction Co., has been named general manager of engineering. **Frank J. Knoll,** manager of design engineering, has been named manager of engineering production. **Thomas G. Papavero,** division engineer, piping and layout, will succeed Knoll as manager of design engineering.

Two oil men have been elected vice presidents of AIME to serve with **Lloyd E. Elkins,** Pan American Petroleum Corp., Tulsa, who takes over in February as president of the association. The vice presidents are **Herbert F. Beardmore,** Gulf Oil Corp., Houston, and **Earl M. Kipp,** Standard Oil Co. of California, San Francisco. **Douglas Ragland,** Humble, Houston, has been elected to a 3-year term as a director of AIME.

Frederick W. Atherton, partner in charge of the oil department of Loomis, Sayles & Co., Boston investment counsel firm, will join Continental Oil Co. about November 1. Atherton will be concerned with analytical appraisal of company operations and projects from the point of view of shareholder - company relations. He is expected to be elected a vice president of the company. Atherton had been oil-industry specialist for Loomis, Sayles & Co. since 1931.

C. A. Deveny has been promoted to staff engineer in the cracking and light-ends department of Humble's Baytown, Tex., refinery.

Deaths

Oliver W. Van Petten, 69, retired vice president and director of Columbian Carbon Co., died August 18 in a San Diego, Calif., hospital. Van Petten was with Inland Gas Co. in Ashland, Ky., before joining Columbian Carbon in Charleston, W. Va., as superintendent. He was elected vice president in 1948 and headed the Appalachian division. He retired in 1958.

Robert M. Aude, 47, president of the Heyden Chemical division of Heyden Newport Chemical Corp., died August 20 at his home in Upper Saddle River, N. J., after a short illness. Aude was with Monsanto Chemical Co. before joining Heyden. He had been president of the Heyden Chemical division since 1960.

James L. Sheaff, 48, engineer with Tennessee Gas Pipeline Co. in Houston, was killed August 21 in a hunting accident near Manassa, Colo.

Forrest Arnold Smith, 54, partner in C & S Drilling Co., Wichita Falls, Tex., died August 18 in a Tulsa hospital.

Richard K. van Sickle, 61, who held oil producing concessions in Austria, died at Baden, near Vienna, recently. A Romanian-born son of a British oil expert, van Sickle was a key figure in the Austrian oil industry both before and after World War II.

Dr. Eugene Paul Schoch, 89, long time member of the University of Texas faculty, died August 15 in Austin, Tex. Dr. Schoch was active in petroleum and chemical research at the university during his 60 years there. He received the American Chemical Society's first Southwest regional award in 1948 and, in 1955, was named Texas' outstanding engineer of the year. The Eugene P. Schoch lecture series in chemical engineering was set up at the university in 1956 in his honor.

Lee H. Armer, 57, Fort Worth independent oil producer, died August 13 at his home after a long illness. He had been an independent operator in the area since 1936.

James R. Welsh, 44, North Texas district reservoir engineer with Humble Oil & Refining Co. in Houston, was killed August 12 in an auto accident near McAlester, Okla.

Neil Miller, 59, treasurer of Dowell division of Dow Chemical Co., died August 20 in a Tulsa hospital of cancer. Miller had been with Dowell since 1936.

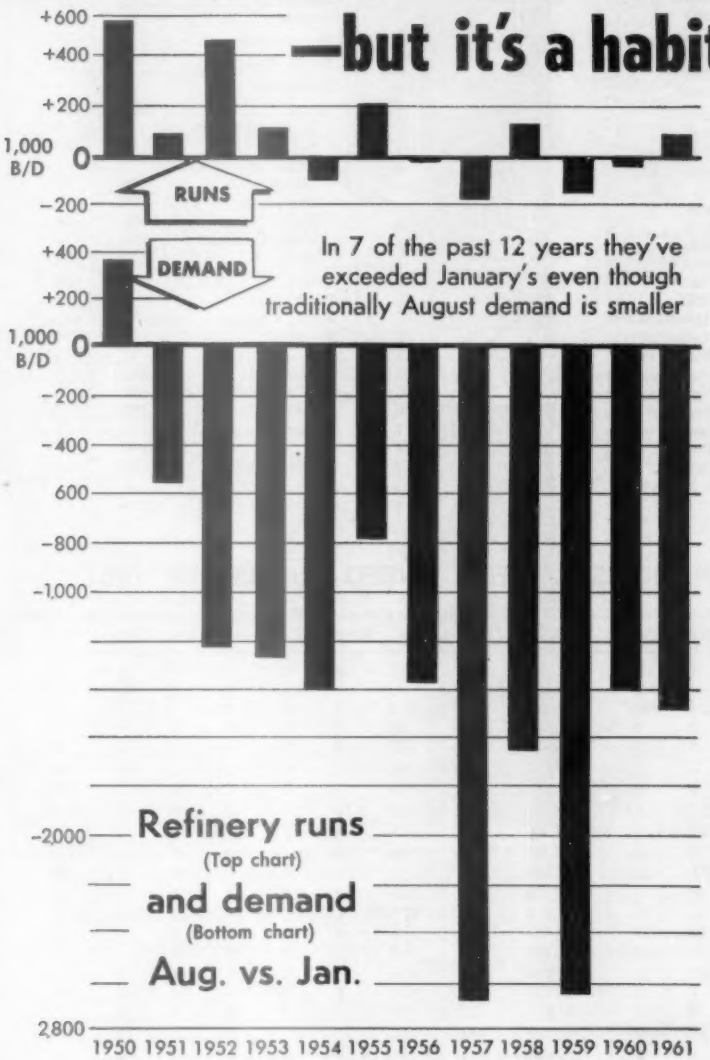
Edmond C. Breene, 83, chairman of Winona Oil Co. of Delaware, died August 23 in an Oil City, Pa., hospital. Breene was president of Winona, which he helped found in 1906, before becoming chairman. He was also one of the founders of Pennsylvania Grade Crude Oil Association and was its first president. He was a director of Petroleum Publishing Co., publishers of The Oil and Gas Journal. Breene was honored as Grand Old Man of Production at the last International Petroleum Exposition in 1959. His five sons are all active in the oil industry.

Nelson K. McFarland, 57, Dalworth Equipment Co., died August 12 in Dallas after a long illness. McFarland had been with Oklahoma Contracting Co. and Lone Star Pipe Line Constructors before joining Dalworth. He served as a director of Pipe Line Contractors Association from 1954 to 1956.

R. Donald Pinkerton, 53, research associate with Sinclair Research, Inc., in Harvey, Ill., died August 18 in Tulsa after a heart attack. Pinkerton had been with Sinclair for 30 years.

Claude S. Morrison, 76, retired California independent operator, died August 10 at his home in Bakersfield, Calif.

Yes, August runs are higher —but it's a habit



BY JOHN C. CASPER

THERE IS NO sound reason why refinery runs should be higher in August than in January. Indeed, there are logical arguments for **decreased** runs during the summer months.

Records of refinery operations for the past 12 years seem to indicate that refiners are in a rut. The chart gives the picture of winter-summer changes in refinery runs and also seasonal shifts in demand.

The top segment of the chart compares August runs with January runs each year since 1950. Note that August runs have been higher than January runs for 7 out of the 12 years.

August runs topped January runs each year for the first 4 years of the period starting with 1950. In 1950, August runs exceeded runs in January by 584,000 bbl. daily. Even demand in August was 370,000 bbl. daily higher than January demand.

Near-Constant Runs Prevail

Considering the full 12-year period, runs were higher in August than in January for 7 of the years. For the past 9 years, refiners seem to have drifted into the habit of near-constant runs throughout the year with no attempt to tailor runs to changes in product demand.

From the refiner's viewpoint, there is one excuse for high and constant runs throughout the year. His over-all processing costs do not drop proportionately with decreases in refinery input. When he divides fixed costs by reduced input, he comes out with higher processing cost per barrel.

However, there are several good reasons for bringing runs more in line with demand.

1. Too much emphasis on processing cost per barrel tends to boost runs above requirements.

2. Cost of storage must be considered. It may run as high as a cent a gallon.

3. Excessive product inventories require abnormal selling programs with reduced realization from a barrel of surplus material.

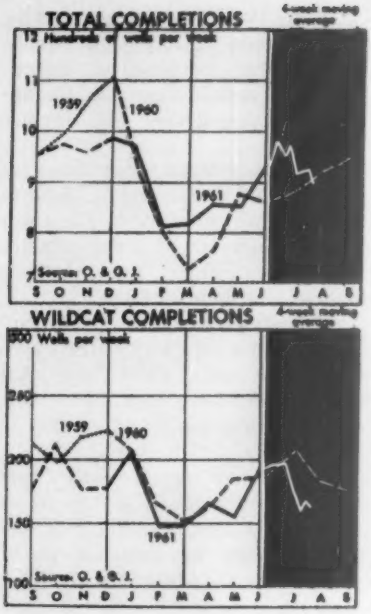
4. Forced sales of products tend to wreck the over-all price structure.

The answer: Let demand dictate your run policy.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,064,600	UP	19,450	UP	108,733
Crude stocks	256,031,000	UP	844,000	UP	17,352,000
Completions	933	UP	104	UP	94
Refinery runs	8,339,000	DOWN	98,000	UP	204,000
Gasoline stocks	193,621,000	UP	1,523,000	UP	1,527,000
Kerosine stocks	32,801,000	UP	678,000	UP	1,433,000
Distillate stocks	141,635,000	UP	3,708,000	DOWN	2,196,000
Residual stocks	48,943,000	DOWN	1,062,000	UP	4,629,000
Four-product stocks	417,000,000	UP	4,847,000	UP	5,393,000
Total imports	1,564,100	DOWN	461,300	DOWN	64,200

Active Rotary Rigs



	8-21-61	8-14-61	8-22-60
Alabama	6	4	4
Alaska	11	11	7
Arkansas	13	15	13
Arizona	0	0	1
California	77	73	82
Land	72	71	81
Offshore	5	2	1
Colorado	29	30	44
Florida	1	1	2
Land	0	0	2
Offshore	1	1	0
Georgia	1	0	0
Illinois	37	43	39
Indiana	6	8	11
Iowa	1	2	0
Kansas	91	107	112
Kentucky	4	3	3
Louisiana	280	267	291
North	47	42	38
S. Inland waters	103	103	112
S. Land	77	75	78
Offshore	53	47	63
Maryland	0	0	1
Michigan	27	28	45
Mississippi	71	68	56
Missouri	1	2	1
Montana	25	25	24
Nebraska	29	18	19
New Mexico	127	115	112
New York	1	1	0

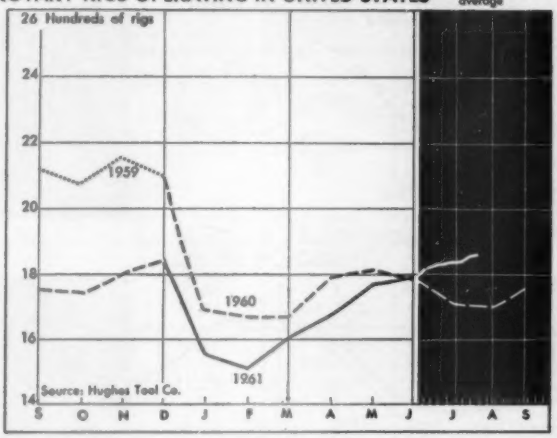
	8-21-61	8-14-61	8-22-60
North Dakota	16	17	14
Ohio	9	8	3
Oklahoma	215	214	157
Oregon	0	0	1
Pennsylvania	9	9	9
South Dakota	1	2	0
Tennessee	0	0	1
Texas	662	683	560
S. Inland waters	9	9	2
S. Land	173	183	171
Offshore	2	2	0
North	67	67	45
Panhandle	65	72	42
East	65	68	48
West Central	156	158	145
West	125	124	107
Utah	34	34	30
Washington	1	1	1
West Virginia	12	13	5
Wyoming	65	68	62
Total U. S.	1,862	1,870	1,710
Cum. avg. to date	1,696	1,690	1,733
Western Canada	150	137	172
Eastern Canada	2	2	0
Grand total	2,014	2,009	1,882

Hughes Tool Co. report.

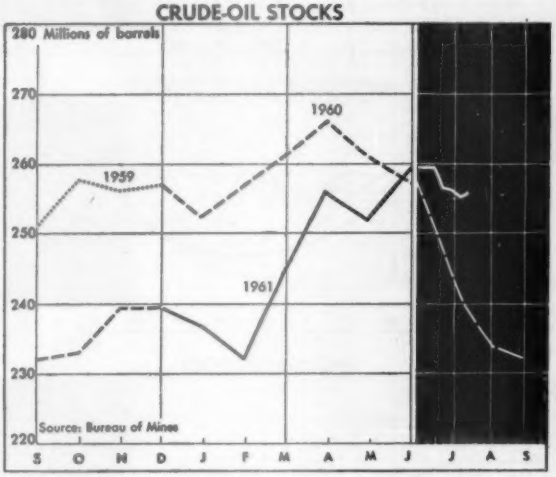
WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 19, 1961

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1961	1960	Total	Crude	Cond.	Gas	Dry	1961	1960
Alabama	0	0	0	0	0	0	0	31	31	0	0	0	0	0	7	2
Alaska	2	1	0	1	0	0	25,682	28	.....	1	0	0	1	0	5	.....
Appalachian	87	25	0	41	6	15	217,825	1,363	1,135	3	0	0	1	2	52	38
Arizona	2	0	0	0	2	0	1,947	16	25	1	0	0	0	1	10	18
Arkansas	9	2	0	2	5	0	44,933	317	379	2	0	0	0	2	65	104
California	46	35	0	5	6	0	167,653	1,053	1,048	5	0	0	2	3	163	197
Colorado	7	1	0	1	5	0	42,243	379	399	3	1	0	0	2	180	200
Illinois	43	22	0	0	21	0	104,859	1,201	1,362	14	3	0	0	11	276	288
Indiana	23	11	0	1	11	0	31,386	447	628	4	1	0	0	3	119	232
Kansas	55	23	0	3	27	2	193,286	3,272	2,049	14	0	0	1	13	610	659
Kentucky	25	13	0	0	12	0	28,254	1,241	1,163	1	0	0	0	1	89	117
Louisiana	81	33	7	5	36	0	590,728	2,392	2,218	14	0	0	0	14	380	350
North	31	9	3	3	16	0	88,914	932	825	8	0	0	0	8	163	169
South	38	18	2	1	17	0	389,453	1,110	1,074	4	0	0	0	4	180	158
Offshore	12	6	2	1	3	0	112,361	350	319	2	0	0	0	2	37	23
Michigan	26	9	0	1	11	5	69,944	478	554	7	1	0	1	5	174	148
Mississippi	14	6	1	0	7	0	104,427	347	438	6	1	0	0	5	117	164
Montana	8	6	0	0	2	0	41,863	237	188	2	0	0	0	2	111	91
Nebraska	19	4	0	0	15	0	93,526	646	560	11	1	0	0	10	312	230
New Mexico	41	19	0	9	13	0	225,640	1,127	1,181	4	0	0	0	4	184	183
West	13	4	0	9	0	0	73,265	500	387	0	0	0	0	0	59	42
East	28	15	0	0	13	0	152,375	627	794	4	0	0	0	4	125	141
North Dakota	6	4	0	0	2	0	33,675	167	192	1	0	0	0	1	43	50
Ohio	16	7	0	3	4	2	48,261	649	633	2	1	0	0	1	30	34
Oklahoma	119	55	1	11	35	17	377,292	3,711	2,954	5	1	0	1	3	358	475
Texas	286	138	7	20	109	12	1,270,386	9,185	10,068	66	7	2	4	53	1,913	2,081
District 1	19	4	1	3	11	0	62,474	558	695	12	0	1	1	10	222	259
District 2	18	1	2	1	14	0	114,336	503	476	8	0	1	0	7	138	116
District 3	18	5	1	0	12	0	129,508	739	780	5	0	0	0	5	145	147
District 4	17	3	1	1	12	0	105,300	785	696	0	0	0	0	0	180	197
East	22	12	0	0	10	0	123,764	783	808	6	0	0	0	6	196	169
District 7-B	35	17	0	1	17	0	94,383	1,160	1,465	9	1	0	0	8	319	423
West	64	45	0	5	8	6	316,575	2,266	2,648	9	3	0	0	6	483	409
District 9	67	40	2	0	20	5	198,136	1,640	1,837	10	2	0	0	8	169	319
District 10	26	11	0	9	5	1	125,910	751	663	7	1	0	3	3	61	42
Utah	3	1	0	0	2	0	15,705	156	165	1	1	0	0	0	70	55
Wyoming	11	5	0	0	6	0	52,657	591	664	4	0	0	0	4	220	268
Misc. (Mo.)	4	0	0	0	4	0	5,538	138	111	4	0	0	0	4	125	92
Total U. S.	933	420	16	103	341	53	3,787,710	29,172	28,145	175	18	2	11	144	5,613	6,076
Prev. week	829	380	27	72	331	19	3,983,853	.....	.....	206	25	1	6	174	.....	.....
Cum. 1961	29,172	13,066	608	2,874	10,474	2,150	117,468,210	.....	.....	5,613	493	62	257	4,801	.....	.....
Cum. 1960	28,145	12,902	841	2,295	10,848	1,259	120,186,521	.....	.....	6,076	541	68	194	5,273	.....	.....
Western Canada	37	19	0	4	11	3	193,065	1,392	1,468	5	0	0	0	5	351	398

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	8-12-61	8-5-61	8-13-60
Pennsylvania	2,471	2,491	2,302
Other Appalachian	1,654	1,746	1,710
Illinois, Indiana, Michigan	10,124	10,554	9,247
Nebraska and North Dakota	3,764	3,720	2,914
Kansas	9,576	9,783	8,568
Oklahoma	17,050	17,019	16,324
Arkansas	1,853	1,953	1,805
Louisiana	21,240	20,611	18,232
North	3,317	3,374	3,058
South	17,923	17,237	15,174
Mississippi, Alabama, Florida	1,829	1,738	2,472
New Mexico	7,926	7,558	8,258
Texas	108,778	109,827	99,679
East Texas	8,356	8,914	8,015
West Texas	48,603	48,765	46,921
Texas Gulf	18,745	19,200	16,780
Other Texas	33,074	32,948	27,963
Wyoming	17,285	17,298	16,534
Other Rocky Mountain	9,859	9,633	9,421
California	24,281	23,899	26,819
Foreign	†18,341	17,357	14,394
Total	**256,031**	255,187	238,679

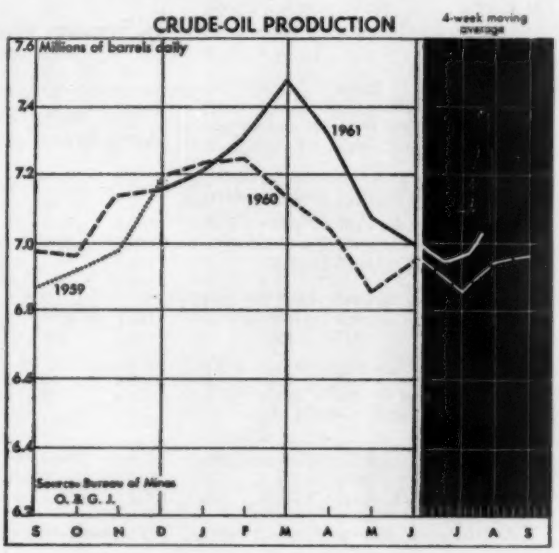
*Bureau of Mines. †Includes 5,434,000 bbl. in California.

DAILY AVERAGE PRODUCTION FOR WEEK

	August 19, 1961 Crude oil	Lease condensate	Total	Aug. 12 total
Alabama	19,800	.....	19,800	19,450
Alaska	19,500	.....	19,500	19,400
Arkansas	78,200	100	78,300	78,200
California	813,600	.....	813,600	814,000
Colorado	124,600	.....	124,600	124,450
Eastern	39,800	.....	39,800	41,000
Florida	1,000	.....	1,000	1,000
Illinois	213,600	.....	213,600	206,300
Indiana	29,800	.....	29,800	29,000
Kansas	†311,400	.....	†311,400	†308,200
Kentucky	50,500	.....	50,500	51,300
Louisiana	996,800	137,850	1,134,650	1,134,950
North	105,800	5,350	111,150	111,450
South	891,000	132,500	1,023,500	1,023,500
Michigan	53,700	.....	53,700	53,800
Mississippi	146,600	3,650	150,250	150,250
Montana	85,900	.....	85,900	86,400
Nebraska	58,400	.....	58,400	56,600
Nevada	450	.....	450	450
New Mexico	315,000	7,500	322,500	322,500
North Dakota	55,400	.....	55,400	55,500
Oklahoma	†508,500	.....	†508,500	†505,000
Texas	2,418,000	89,650	2,507,650	2,507,650
Dist. 1	42,000	2,600	44,600	44,600
Dist. 2	100,000	7,900	107,900	107,900
Dist. 3	312,000	38,000	350,000	350,000
Dist. 4	176,000	12,500	188,500	188,500
Dist. 5	27,000	600	27,600	27,600
Dist. 6	113,000	8,000	121,000	121,000
East Texas field	128,000	.....	128,000	128,000
Dist. 7-B	125,000	400	125,400	125,400
Dist. 7-C	103,000	3,450	106,450	106,450
Dist. 8	994,000	12,000	1,006,000	1,006,000
Dist. 9	193,000	2,500	195,500	195,500
Dist. 10	105,000	1,700	106,700	106,700
Utah	85,400	.....	85,400	83,600
Wyoming	399,300	.....	399,300	395,450
Others	‡600	.....	‡600	‡700
Total U. S.	6,825,850	238,750	**7,064,600**	7,045,150
Change from prev. week, up			**19,450**	
Canada	†654,000	.....	†654,000	†624,150
Total U. S. Prod.—Jan. 1-Aug. 19			1,660,873,400 bbl.	
Same period last year (crude plus cond.)			*1,631,157,000 bbl.	

*Includes 52,751,000 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Arizona.

CRUDE-OIL PRODUCTION



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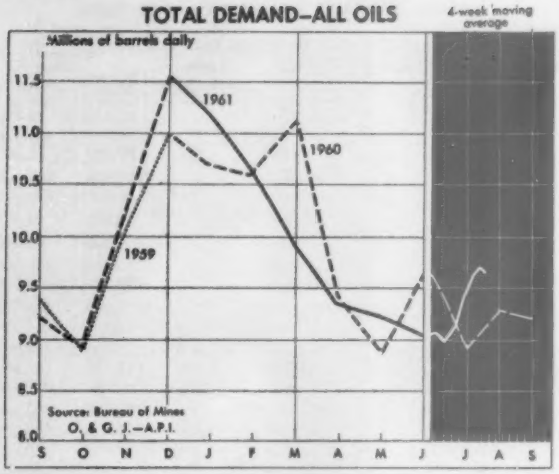

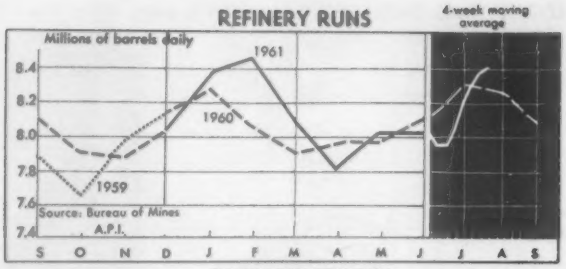

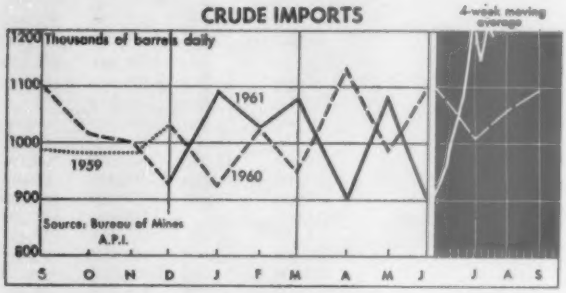

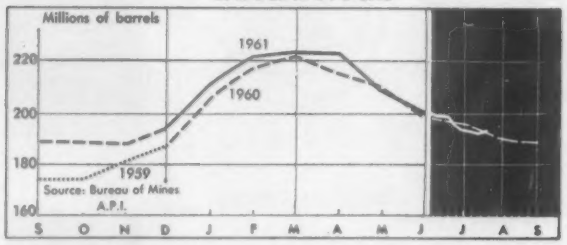

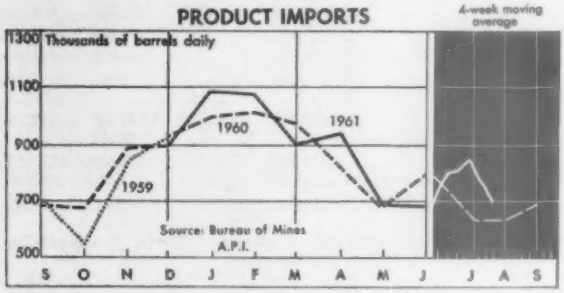

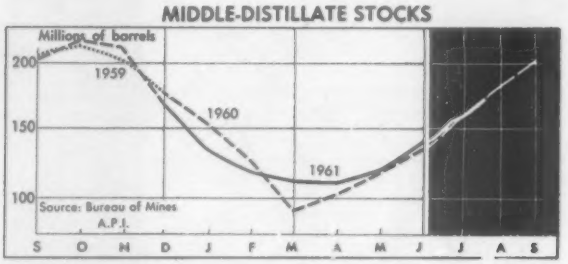

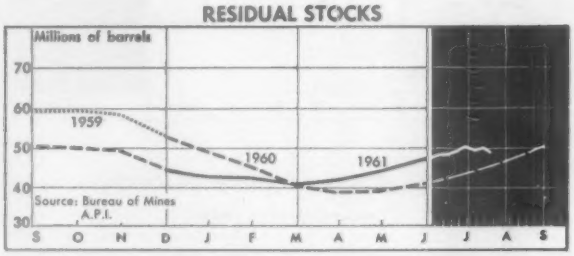

API REFINERY REPORT—AUGUST 18, 1961
(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, August 1960: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,153	524.9	25.6	360.6	137.0	46,546	12,001	47,557	12,907	1,128	490.0	33.8	299.7	140.4
Appalachian:														
District 1	97	34.0	2.4	25.0	4.7	5,267	619	3,053	387	94	41.2	3.1	22.5	8.0
District 2	111	57.9	4.4	22.9	7.0	2,583	448	1,547	332	109	53.5	3.8	19.7	10.5
Ind., Ill., Ky.	1,608	806.4	88.7	368.3	131.4	32,327	6,742	25,465	5,544	1,511	693.1	64.8	262.0	130.9
Minn., Wis., Dak.	153	69.9	4.6	36.7	29.7	6,932	1,528	7,391	673	132	38.5	2.0	17.7	15.2
Okla., Kans., Mo.	738	423.7	15.3	190.9	16.3	17,899	1,727	11,729	948	752	384.8	13.7	150.5	16.8
Inland Texas	319	219.3	10.3	49.6	24.1	7,226	600	1,713	2,739	308	211.3	8.3	49.7	21.2
Texas Gulf Coast	1,882	1,012.4	114.2	517.1	128.7	26,425	3,714	17,087	5,302	1,886	972.7	87.7	448.1	137.1
La. Gulf Coast	659	364.3	59.0	162.0	42.9	9,972	2,557	5,390	1,323	679	390.6	53.0	139.1	47.5
N. La. and Ark.	117	69.1	5.7	26.1	5.6	5,812	625	2,141	175	109	69.4	3.7	26.4	6.8
Rocky Mountain:														
New Mexico	26	12.1	0.4	5.1	4.9	611	47	204	64	26	12.5	0.4	4.2	2.1
Other Rocky Mt.	304	138.1	1.1	64.4	32.3	5,981	625	2,859	1,089	313	139.6	6.5	60.8	34.7
West Coast	1,172	557.3	37.3	201.6	241.4	26,040	1,568	15,499	17,460	1,203	563.4	39.1	204.9	285.3
Aug. 18, 1961	8,339	4,289.4	369.0	2,030.3	806.0	193,621	32,801	141,635	48,943	8,250	4,060.6	319.9	1,705.3	856.5
Aug. 11, 1961	8,437	4,294.4	370.7	1,960.9	781.0	192,098	32,123	137,927	50,005	.....	.....	.....	.....	.....
Aug. 19, 1960	8,135	4,209.6	349.3	1,871.0	803.7	192,094	31,368	143,831	44,314	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

CRUDE-OIL PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Jules-burg	Wyo. (sour)
14.14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	$1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.91
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	(†)	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	.281	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague. †Two buyers announced increase.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	$4.80
Middle District	4.52
Southwest Pennsylvania	4.25
West Virginia	4.17
Breckenridge	4.0
Illinois Basin	3.00-3.05

FOREIGN

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)	
Arabian, 34.0°-34.9°, Ras Tanura	$1.80
Iranian, 34.0°-34.9°, Bandar Mashur	1.78
Iranian, 34.0°-34.9°, Abadan	1.73
Iraq, 35.0°-35.9°, Fao	
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.59
Qatar, 41.0°-41.9°, Umm said	1.95
Middle East, E. Mediterranean:	
Arabian, 34.0°-34.9°, Sidon	$2.17
Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli	2.19
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 36°	2.42
Canada:	
Leduc-Woodbend	$2.53
Redwater (Alta.)	2.42
Weyburn (light)	2.085
Midale C	1.71
Venezuela:	
Cumarebo, 47°-47.9°, Tucupido	3.34
San Joaqin, 40°-40.9°, Puerto La Cruz	3.08
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

TANKER RATES (Long ton)

(Latest reported spot fixtures)

★ Gulf-NY, dirty (ATRS—27.5%)	$2.07
★ Carib.-NY, dirty (ATRS+45%)	1.51
★ Gulf-UK, clean (ATRS+20%)	9.12
★ PG-Japan, dirty (USMC—62.5%)	3.83
PG-NY, dirty (ATRS—67.5%)	3.87

★Denotes change from previous week.

REFINED PRODUCTS

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless other wise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (91 octane)	10.75-11.00
★ Premium (99 octane)	13.50-13.75
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.75-11.00
Regular (92 octane)	11.00-11.25
Premium (98 octane)	12.00-12.25
California (rack) Los Angeles:	
Regular (90 octane)	11.60
Premium (94 octane)	12.60
Premium (100 octane)	14.10
Caribbean area (cargoes):	
★ Regular (87 octane)	9.00
★ Premium (97 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.50-9.75
Diesel oil (58 d.i. and above)	9.00-9.25
Distillate No. 1	9.00-9.25
Distillate No. 2	8.25-8.50
Gulf Coast (cargoes):	
Kerosine 41-43	9.50
Distillate No. 2	8.50
New York Harbor (barges):	
Kerosine 42-43	11.20
Distillate No. 2	10.20
Diesel fuel, 48-52 d.i.	10.35
Caribbean area (cargoes):	
Distillate No. 2	8.25

RESIDUAL FUEL

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.65-1.75
Gulf Coast (cargoes):	
Bunker C fuel	2.20-2.30
New York Harbor (barges):	
Bunker C fuel	2.52
Caribbean (cargoes):	
Bunker C fuel	2.00
California (rack):	
Bunker C fuel, Los Angeles	2.25

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EXCEPT . . .

WESTERN STATES: (California, Washington, Oregon, Idaho, Nevada, Utah, and Arizona). Write: Classified Departments, Inc., The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif. Phone AXminister 2-0287. Copy deadline Monday noon.

FOR SALE EQUIPMENT

USED GAS PROCESSING Equipment: Glycol and Dry Dessicant Dehydrators; Quick-cycle Hydrocarbon Recovery Units; Water Flood Filter-pump Units. Also new oil and gas production equipment. Engineered Specialties Co., P. O. Box 35683, Phone FL 1-5284, Dallas 35, Texas.

1–7¼ x 12" GD pump with NHIS Cummins diesel engine $8,000.00
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1–16 KW light plant with gas butane carbureter $500.00
Also casing slips, spiders, elevator bails, weight indicators, miscellaneous equipment.

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Located—Bishop, Texas and Magnolia, Arkansas

Absorbers—Towers—Vessels—100# to 2100# w.p.

Tanks—Reboilers—Electric Motor-Driven Centrifugal and Reciprocating Pumps—Atmospheric Coolers—Heat Exchangers—Compressor Cylinders—Boilers—Meters—Regulators—Generators—Building—Cooling Towers—Valves—Miscellaneous Tanks including 10,000 Bbl. Floating Roof.

All Material Excellent Condition
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Tulsa, Oklahoma

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at WHITING, IND.

COMPRESSORS

3—2495 CFM @ 205 PSI Steam Driven
3—11840 CFM @ 325 PSI Steam Driven
1—2760 CFM @ 325 PSI 800 HP

DRUMS

8' x 30' 222 PSI Design
6' x 15' 342 PSI Design
6' x 22' 1260 PSI Design

TOWERS

8' x 63'—18 tray 390 PSI
7' x 83'—30 tray 342 PSI
4' x 83'—34 tray 222 PSI

PUMPS—EXCHANGERS—VESSELS

Write for Inventory
Send Us Your Requirements

HEAT & POWER CO., INC.
60 East 42nd St., New York 17, N. Y.
310 Thompson Bldg., Tulsa, Okla.

FOR SALE EQUIPMENT

FAILING 1500 GOOD machine also pulling unit, and Vermeer trencher in east Kansas. J. E. Newton, 238 South Elm Ave. Webster Groves, Missouri.

AN INVESTMENT! Productive advertising is an investment rather than an expenditure. Experienced oil men have found that The Oil and Gas Journal is their best classified advertising medium.

1—1952 MODEL 48-L Bucyrus-Erie Drill, trailer mounted, equipped with WAKU-D Diesel engine, 70' Tripped derrick, and tool crane. Machine has been used to drill only 9,000 ft. of hole. Cleaned and repainted. The Buckeye Supply Company, P. O. Box 1231, 18 Harrison Street, Zanesville, Ohio.

AT N. LITTLE ROCK, ARKANSAS

3—Worthington #LTC-4 compressors. 3500 CFM @ 45 PSI, 24 x 15, 2-cyl., 500 HP, 4-cycle. gas-engine drive.

Phone POplar 3-3505

PERRY EQUIPMENT CORP.
1402 N. Sixth St.
Philadelphia 22, Pa.

USED EQUIPMENT SALE

at DX Sunray's Tulsa refinery

Solvent Dewaxing Plant

Filters, Presses, Condensers, Chillers, Exchangers, Pumps, Compressors, Motors, Vessels.

DX SUNRAY OIL COMPANY
P. O. Box 381, Tulsa
Inquire L. G. Wells
Phone LU 3-4300

COMPLETE LIQUIDATION
GASOLINE PLANT
ST. ELMO, ILLINOIS

Absorber, Reabsorber, Still, Stabilizers, Pressure Vessels, Butane, Propane and Gasoline Storage Tanks, Boilers, Heat Exchangers, Motor-Driven Pumps, Compressors, Two Electric Generating Plants, Truck Loading Rack, Rail-Car Loading Rack, Buildings.

This plant built to process 16 M.M. c.f./day with 60,000 gallons natural gasoline, 50,000 gallons butane, and 50,000 gallons propane.

Bids will be accepted on complete plant or on individual items.

HUMBLE OIL & REFINING COMPANY
To inspect: Contact Mr. W. S. Stovall, Box 43, St. Elmo, Ill.
Information Only: Mr. J. F. Scott, Box 801, Tulsa, Okla.

FOR SALE EQUIPMENT

LOG MASTER logging unit complete—Depth capacity 3,000 ft.—Equipped to provide 3 curve logs (S.P.—16-64 inch normal) Mounted in Ford Truck—Spare parts and cable—Optional equipment available. Contact: T. C. Largent, 10455 Goodyear, Dallas 29, Texas, Phone FL 7-7637.

Trailer mounted Franks 2,000 rotary, GMC Diesel, 53-ft. mast 8½-in. rotary, 5½x8 G.D. pump, GMC Diesel, 4,000 ft. 2⅞-in. drill tubing, 300 ft. 4½-in. drill collars, 1957 IHC 200 tandem tractor, K8 tractor, Chevy A frame winch truck, two 35-ft. tandem trailers, light plant, etc., etc. All in good cond. Location Grand Junction, Colo. Total price $50,000. Junction Drilling Co., 2011 Glenarm. KE 4-0253.

LIQUIDATION
at ESSO REFINERY Balto., Md.

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TOWERS—30" to 84" diameter, 20' to 97' high, 7 to 34 trays, up to 360 PSI

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NEW FURNACE TUBES—4000'—⅜" & ½" Wall Croloy 5—4" to 6"

PUMPS—88 to 400 GPM up to 2040' head—up to 8 Stage

HEAT EXCHANGERS—CONDENSERS

Stainless Tubes —235 to 2320 Sq. Ft.
Croloy 5 Tubes —573 to 1040 Sq. Ft.
Admiralty Tubes —216 to 1640 Sq. Ft.
Steel Tubes —238 to 2240 Sq. Ft.

COMPRESSORS & BLOWERS

7500CFM @ 42.5PSIG, 1250HP Synch.
129CFM @ 193PSIA Worth. HB 7½x9

LARGE QUANTITY TRANSFORMERS & MOTORS

WRITE FOR CATALOG

HEAT & POWER CO., INC.
60 East 42nd St., New York 17, N. Y.
310 Thompson Bldg., Tulsa, Okla.
Boston & Haven St., Baltimore 24, Md.

FOR SALE EQUIPMENT

FOR SALE Two U-15s, excellent condition, complete in every detail. Inventory and price on request. Box M-492, The Oil and Gas Journal, Tulsa, Oklahoma.

COMPLETE DRILL stem testing unit. Wire line truck with temperature and pressure recorders. Latta Precision Service Company, 1354 Crescent Drive, El Dorado, Kans.

(8) 96,000 Bbl. 120'x48'
WELDED CONE ROOF
OIL STORAGE TANKS
INSTALLED NEW in 1952
Dismantled, Matchmarked For
Reerection $75.00 N.T.
FOB Baltimore, Md.

HEAT & POWER CO., INC.
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Boston & Haven Sts., Baltimore 24, Md.

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FOR SALE OR TRADE

Will sell outright or swap for your surplus pipe sizes, the following New Low Pressure Pipe in double random lengths, beveled for welding:

AT NEW ORLEANS NOW:

12,000'—30" OD x .312" x 99# x 450 PSI test
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AT HOUSTON NOW:

1,000'—32" OD x .500" x 168# x 1,100 PSI test
4,500'—36" OD x .406" x 154# x 400 PSI test

This Pipe Must Go—And
It's Priced to go FAST!
Write, Wire or Phone (COLLECT)
Les Crancer, Jr.
PRospect 3-3020

VALLEY STEEL PRODUCTS CO.
124 Sidney Street, St. Louis 4, Mo.

50,000 ft. 20" No. 1 grade used pipe.
Lengths 20 ft. square cut ends.
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High Tensile Pipe.
Indiana-Ohio Pipe Co.
P. O. Box 5482 Shep. Sta.
Columbus 19, Ohio
Phone CL 3-5527—CL 3-5528

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2⅜" O.D., 3.65#	87,000'
3½" O.D., 4.51#	32,000'
4½" O.D., 5.97#	27,000'
6⅝" O.D., 11.8#	15,000'
8¾" O.D., 16.9#	17,000'
10¾" O.D., 20.3#	4,000'
12¾" O.D., 25.16#	2,000'
14" O.D., 27.66#	2,000'
16" O.D., 31.66#	3,900'
18" O.D., 35.67#	6,200'
20" O.D., 39.7#	2,400'

All above machine cleaned, straight, in approx. 40' DRL, beveled, good condition. Most suitable for gas or crude oil gathering systems. Priced attractively for shipment from Shreveport, Louisiana.

MID-STATES PIPE AND SUPPLY CO.
P. O. Box 2534 Phone LUther 2-9128
Tulsa, Oklahoma

FOR SALE EQUIPMENT

28L PORTABLE. New Condition. Completely and fully equipped with all tools including Truck, Trailer, Doghouse, Forge and Power Plant. Call Bill Roberts, Glasglow, Ky. telephone OL 1-3850.

USED NATIONAL T-12 Drawworks with Foster Automatic Makeup and Breakout Cathead, excellent condition. Also, 51 Double Shrunk National Tool Joints. Direct inquires to 1203 National Tower Building, Jackson, Michigan.

FOR SALE—100 miles of 6⅝" O.D. #18.97 T.&C. in the ground or to your Specification. Weiner Brothers, 1017 Empire Bldg., Pittsburgh 22, Pa.

WELL SERVICING UNITS FOR SALE Franks Model 26-DTM Double drum well servicing units, complete with lines and tools. Located northeastern Oklahoma. Box 5371, Tulsa, Oklahoma.

1—MA-4 CLARK Compressor 4¼ x 7¾ x 8, 2 Stage 1000# WP one third new price. Also 1—4½ x 9 Single Stage ES-1 Ingersoll 1000# WP with 145 GK Waukesha. 1—Ditto with 140 GK Waukesha. Both one half new price. N. L. Clark Equipment Co., 225 N. Port, Corpus Christi, Texas.

FAILING 2500, 1500, Trucks, Floats, Drill Pipe, Collars, and related Equipment. Survey Drilling Company, 2032 Hawes Avenue, Dallas 35, Texas.

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Complete with Derrick, Mud Pump G-D FXO 7¼ x 10, Rotary Table with GM-4-71 engine, Shaker, N69 Ideal Swivel, Hoist, Drill Collars, Bits, Parts, etc. . .

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LIQUIDATING at Torrance, Cal.
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MUST BE OUT IN 90 75 DAYS
TOWERS—REACTORS—HEAT EXCHANGERS
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COMPRESSORS—PUMPS—FILTERS
HOPPERS—BINS—ELUTRIATOR
Write for Inventory
Representative on Premises
Send Us Your Requirements

HEAT & POWER CO., INC.
60 East 42nd St., New York 17, N. Y.
310 Thompson Bldg., Tulsa, Okla.

EQUIPMENT WANTED

WANTED TRUCK mounted Hydraulic Casing Pulling machine, complete, ready to work. Prefer one with ⅞" sand line and power brake out. Call or write Luke Wise, Community Gas & Oil Co., Billings, Montana.

HELP WANTED

REFINERY ENGINEER—Graduate engineer, preferable B.S. in mechanical engineering with at least two to three years refinery experience, to supervise scheduling of maintenance, new construction, etc., for modern refinery in mid-continent area. Our employees have been informed of this advertisement. Box M-518, The Oil and Gas Journal, Tulsa, Oklahoma.

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FOR WELL ESTABLISHED
PRODUCTS PIPELINE COMPANY

Responsible for maintenance of all electrical facilities in district including remote control pump stations. Good plans and benefits. West Texas headquarters.

Box 31 Q 233
The Oil and Gas Journal
4041 Marlton Ave., Los Angeles 8, Calif.

HELP WANTED

OIL JOB DIRECTORY, foreign and domestic, showing where to apply for jobs. $5.00 cash OIML Co., Box 2603, Tulsa, Oklahoma

SUBSURFACE GEOLOGIST. Minimum 5 years experience, South Louisiana. Location, New Orleans. Send Complete resume. All replies confidential. Box M-545, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLOITATION GEOLOGIST, 6-10 years experience, Gulf Coast, North Louisiana, Mississippi, Emphasis, Gulf Coast. Large independent company. Send complete detailed resume. Box M-544, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER

Refinery Process Engineer with Chemical Engineering degree and 3 to 5 years experience, for our Arkansas City, Kansas refinery. Furnish resume of education and experience, references and salary requirements to:

APCO OIL CORPORATION
1000 Liberty Bank Building
Oklahoma City 2, Oklahoma

NATURAL GAS PERSONNEL
McGregor, North Dakota

On or about November 15, 1961, the following experienced natural gasoline plant personnel will be needed for employment:

Plant Operator—Stillmen

Natural Gas Compressor Operators

General Gasoline Plant Mechanic

Assistant General Gasoline Plant Mechanic with some experience in working with pneumatic instruments.

Two Field Gathering System Operators experienced in the repair and operation of orifice meters.

The above openings are located at McGregor, North Dakota. Please send resume of experience to **Hunt Oil Company**, 700 Mercantile Bank Bldg., Dallas 1, Texas, Attn. Personnel Dept.

ELECTRICAL ENGINEER
RESERVOIR ENGINEER

Immediate opportunity to join staff of major oil company in Libya.

Electrical Engineer: 5 to 10 years project engineering experience in the design and installation of electrical power generation and distribution facilities. Gas turbine plant experience desirable.

Reservoir-Engineer: 8 to 10 years experience in performing all types of reservoir studies and calculations to develop original engineering data. Ability to make recommendations concerning location of development wells, well spacing and efficient primary and secondary recovery operations.

Submit complete resume in duplicate to:

Box M-543, The Oil and Gas Journal
Tulsa, Oklahoma

SITUATIONS WANTED

ENGINEER—MANAGER. Seventeen years diversified experience, drilling, production, oil property evaluation, reservoir engineering, production manager. B.S. degree Petroleum Engineering. Complete resume on request. Box M-535, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—Eleven years with major, one with independent producer. Wide range of experience, everywhere except Gulf Coast. Will relocate. Box M-537, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

PALEONTOLOGIST, 44 single, desires overseas position with oil company. 15 years experience with Tertiary and Cretaceous Foraminifera, and ammonites, in California, Colombia and Libya. Some field and wellsite work. Knows Spanish, learning Arabic. Box M-465, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION MAN thoroughly experienced in producing properties, well completions, and workovers wants position as production foreman or superintendent with growing independent. References upon request. Will relocate. J. E. Hodges, 1843 Westridge, Wichita, Kansas.

CHEMICAL ENGINEER seventeen years intensive, broad background in Budget Administration, Economic Evaluations, Cost Analysis, Establishing Accounting Procedures, Manpower and Efficiency Studies, Operations, Technical Supervision, and Petroleum Refining. Box M-522, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERING GEOLOGIST 26, Vet., B.S. Degree. 3 years diversified experience in oil industry. 18 months as manager of Foreign operation, contacting clients, and high level sales. Desires employment as sales engineer with managing potential. Foreign or domestic. Good references. Presently foreign employed. Box M-528, The Oil and Gas Journal, Tulsa, Oklahoma.

SENIOR PETROLEUM Engineer — seeks foreign or domestic position. 10 years production experience. 6 years supervisory and administrative. Request replies contain particulars. Box M-541, The Oil and Gas Journal, Tulsa, Oklahoma.

GAS ENGINEER—36. Want more work and responsibility. Ten years experience, five supervisory. All phases gas sales and engineering. Presently employed. Will travel. Consider any phase gas industry. Personable and reliable. Box M-538, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER—33, single, graduated 1952, registered in Texas. Experience includes drilling, workovers, completions, production, reservoir studies. Box M-546, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER—11 years land evaluation, drilling, completions, workovers, production, corrosion, secondary recovery, reservoir engineering, management. Desires responsible position, will relocate. Box M-549, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER 25, single, two years military service completed. Now employed service company. Wish position with major or independent producing company. Box M-548, The Oil and Gas Journal, Tulsa, Oklahoma.

TREASURER. Texas CPA, Attorney. Chief financial officer company listed American Stock Exchange. Ten years public accounting. Petroleum, contract drilling, wholesaling, estates, trusts experience. Stockholder, SEC reports; taxes; operations analysis; acquisitions and mergers; accounting, economic research. Jhone HOmestead 8-1651. 442 Jan Kelly, Houston 24, Texas.

REAL ESTATE

WARTON, TEXAS, 3 miles from downtown, Wharton, located 0.4 miles East of Highway 59 North. Formerly used as Field Operating Hq's by Magnolia Petroleum Company, Natural Gas Dept. Lots 14, 15, & 16 of Block 2, Peach Acres S/D, tract being 218' x 300', enclosed with 6' cyclone fence. 100' x 30' steel office and shop building, small out buildings, all in excellent condition. Butane tank, electricity, water and paved driveways. Ideal for Field Office or Pipe or Supply Storage. Open for inspection each Tuesday in August or open by appointment—Call Land Dept., Mobil Oil Co., Houston, Texas, FA 3-6121. Mail sealed bids to Mobil Oil Co., Box 56, Houston, Texas, Attention: Wharton Property Sale. Bids must be postmarked before Midnight, September 1, 1961. Bids will be opened September 11, 1961, Mobil reserves the right to reject any or all bids.

PRIME QUALITY OFFICE BUILDING

offered for trade tax-free for producing royalty. Value $800,000, will trade with or without mortgage $275,000. Modern all respects, well rented, located Texas. Please submit information regarding royalty offered.

Box M-534, The Oil and Gas Journal
Tulsa, Oklahoma

MONEY RAISING

SEMI-PROVEN drilling deal. Need associates. Three sands under 800 feet. Kempf, Box 235, Wagoner, Okla.

ROYALTIES

MID STATES Oil & Gas Brokers, Phone Ex. 3-7208, Room 7, Chamber Commerce Bldg., Olney, Illinois. Specializes in selling oil and gas properties. List with us for fast service on buying or selling oil or gas properties.

BUSINESS OPPORTUNITIES

WILL DRILL TEST well in southeastern Ohio with bottom hole money. Let me prove your acreage. I have thousands of acres in this vicinity. David Law, 716 Union Trust Building, Parkersburg, W. Va.

FINANCIAL HELP needed? for Diversified services contact: Kenmo Oil Company, 620 Lee St., Des Plaines, Illinois. CYpress 6-4111.

PRODUCER NEEDS associates to develop proven 160 acres. Bartlesville sand 750' deep, one well already drilled ready for completion Labette County, Kansas. For particulars write: Box M-547, The Oil and Gas Journal, Tulsa, Okla.

NEED PARTNER with tax dollars to drill wells in West Virginia and Ohio at actual cost. Wildcat and semi-proven acreage. David Law, 716 Union Trust Building, Parkersburg, W. Va.

I CAN GET you choice producing royalties and over-rides. Reasonable prices. Contact Box M-513, The Oil and Gas Journal, Tulsa, Oklahoma.

WATERFLOOD PRODUCTION in Marion County, Illinois. Shallow sand formation—185 acres. Detailed engineering data available. Additional capital needed to expand development. Will associate with others or deal entire project. P. O. Box 22, Centralia, Illinois.

WE, TOO, believe that oil is only where you find it but we also believe that the most overlooked shallow play in Illinois is in the western part of the State. New shallow fields produce from 650 feet and above. For information concerning leases and drilling blocks write Petrolini Corporation, P. O. Box 89, Mt. Sterling, Illinois.

ONE THIRTY-SECOND (1/32) override for sale under one hundred thousand acres in Ohio and West Virginia. David Law, 716 Union Trust Building, Parkersburg, W. Va.

OIL & GAS PAYMENT FINANCING

★ ★ ★

COMMERCIAL DISCOUNT CORP.

105 W. Adams St., Chicago 3, Ill.

Phone: ANdover 3-5800

John L. Hines, Vice-President

LEASE AND DRILLING BLOCKS

FOR LEASE—800 acres, John Dixon Survey, N.E. Mineola, Wood County, Texas. Frank Simmon, Box 1801, OCS, Lafayette, La.

DRILLING 155 ACRE lease proven oil producing area Bartlesville Sand production three sides and offsetting production two sides. A proven waterflood sand with large reserves, Contract proposition, MURCO, Box 59, Cherryvale, Kansas.

GOOD PROSPECT. 6,500 acres within mile of good very shallow oil production. Reasonable. Box M-533, The Oil and Gas Journal, Tulsa, Oklahoma.

DO YOU HAVE A LEASE TO SELL? For as little as $5 per week you can tell your proposition to over 45,000 oil men through the Journal's classified advertising pages. You'll be surprised how many are interested.

SOUTHWEST CRANE County, Texas: Oil and gas lease, five years primary term, S/239 acres, section 18, Block B-28, PSL survey, 2 miles from new oil gulf devonian shows in sec. 15, Blk. B-28, PSL, Ward County, Texas. Great potential bargain. Write landowner: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

PROSPECTIVE OIL LEASES: Am fee landowner over 2,000 acres near Pan American Petroleum Corporation No. 1 List, Sec. 23, Block 68, Township 1, T&P Survey, stratigraphic test, projected to 8,500 feet. Anticlinal axis nearby, Hudspeth County, Texas, leases available Hudspeth, Crane, Terrell Counties, Texas. Write landowner: Jefferson G. Smith, 715 Littlefield Building, Austin 15, Texas.

1,500 ACRES, more available, 1½ miles from 7 million gasser. 2,500' pay. Three miles to pipeline Northern Montana. Box M-532, The Oil and Gas Journal, Tulsa, Oklahoma.

WEST VIRGINIA, Lewis and Gilmer Counties 12,000 acres, Braxton 20,000 acres; 20 direct and 30 diagonal offsets to Big Injun wells drilled recently, 5,000 acres proven and 7,000 acres semi-proven. W. D. Hancock, P. O. Box 21, Glenville, West Virginia. B. M. Hastings, Virginia Apts., Parkersburg, West Virginia. GArfield 8-2441.

20 ACRES IN Grimes County, Texas being: West 20 acres out of the South 34 acres out of the following described sixth tract—560.5 acres of land being part of the Wm. McGuffin Headright and A. Luber Headright League. 20 acres in Val Verde County, Texas being: S/2, SW/4, NE/4 of Sec. 14, Block 5 of the I. and G. N. Ry. Co. Surveys. Now owned by Leo Langelier, Box 146, Nashua, N. H.

FOR SALE, my 1/16 working interest in six producing wells in Indiana. 150 acres in field. More wells to be drilled soon. Price $6,000.00. R. W. Christiansen, 116 So. Tenn. Ave., Mason City, Iowa

WEST VIRGINIA Oil and Gas Lease—Eleven thousand acres—two tracts. Proven Area. Direct offset drilling. Salt Sand, Maxton, Big Lime, and Injun Sand. Now producing surrounding our lease from zones less that 2,000 feet depth. Year around market. Low line pressure. No state restrictions on deliveries. Owners desire working interest partner or will sell 50% on checker board basis. We are thoroughly qualified to develop and operate property. Only principals or their agent need apply. Reference Twentieth Street Bank, Huntington, West Virginia. Frank D. Smith and Son, Hines Building, Huntington, West Virginia.

ONTARIO

Regd. Leased Acreage for sale.
Production Bought & Sold.
Farmouts & Assignments available.
Turnkey Drilling—Cable or Rotary.
Production Maintenance.
Supervision &
Management Service.

Write to:

BRADY & FINDLAY LIMITED
Lease Brokers & General Contractors
P. O. Box 367, 65 Sixth Street
Chatham, Ontario

or phone:
Ralph Brady, Townsend 7-1193
Courtright, Ont.

BUSINESS SERVICE

DELAWARE CORPORATION formed and serviced American Guaranty & Trust Company. P. O. Box 487, Wilmington, Delaware.

BUSINESS OPPORTUNITIES

SALE OF SOUTH AMERICAN crude oil. Seeking buyers and agents thoughout the world for South American crude oil. Box M-516, The Oil and Gas Journal, Tulsa, Oklahoma.

FINANCIAL—Investment Banking Houses and Underwriters reached. Confidential. You can send the details of your proposition direct or thru your attorney to Consultant 817—51st Street, Brooklyn, N. Y.

PRODUCTION FOR SALE

FOR SALE: All assets Amtex Oil Co., Inc. Write Robert Whiting, A. and M. College, College Station, Texas for particulars.

BOOKS

FOR SALE: 40 year collection of Geol. Publications. 275 Items. Mainly on California but some Mid-Continent. From U.S.G.S., State of California, U.S.B.M., A.A.P.G., Oklahoma Geol. Survey and Miscellaneous. Many rare, out of print. Price $1,000. For list write: Box 31 Q 245, The Oil and Gas Journal, 4041 Marlton Ave., Los Angeles 8, Calif.

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IT'S BEST . . .
to send your old address clipped from the Journal mailing wrapper along with your new location.

ADVANCE NOTICE . . .
10 days before you move and we guarantee you week - to - week undelayed service.

WRITE . . .
Circulation Department

THE OIL AND GAS JOURNAL
Box 1260 Tulsa 1, Okla.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Indian Affairs, Uintah and Ouray Agency, Fort Duchesne, Utah. Sealed bids will be received until 2:00 P.M. Mountain Standard Time, September 6, 1961, and opened at that time in the office of the Uintah and Ouray Agency, Fort Duchesne, for the leasing of 29,681.81 acres of tribal Indian lands and 979.2 acres of allotted Indian lands, in Townships 3 and 4 South, Ranges 3, 4, and 5 west, Uinta meridian, Duchesne County, Utah, for oil and gas mining purposes. Details of the lease opening and how and where to file bids may be obtained by addressing an inquiry to the Superintendent, Uintah and Ouray Indian Agency, Fort Duchesne, Utah.

LEGAL

NOTICE OF SALE OF OIL, GAS, AND SULPHUR LEASE. Pursuant to the provisions of Chapter 150 of the General and Special Laws of the State of Texas, passed by the 45th Legislature at its Regular Session, as amended by Senate Bill No. 248, passed by the 53rd Legislature at its Regular Session, the Board of Directors of the Agricultural and Mechanical College of Texas hereby offers for sale at public auction in the Office of the Comptroller, Room 202, System Administration Building, College Station, Texas, at 10:00 a.m. Thursday, September 21, 1961, the oil, gas, and sulphur lease on 252.7 acres in Section 71, Block 16, H. & T. C. Ry. Co. Survey, Hardeman County, Texas, comprised of the North 30 acres of the NW ¼ of Sec. 71, the South 122.7 acres of the NW ¼ of Sec. 71, and the South 100 acres of the NE ¼ of Sec. 71, said land being under the exclusive control of the Board of Directors of the Agricultural and Mechanical College of Texas, and occupied by the Texas Agricultural Experiment Station. The right is reserved to reject any and all bids. For lease forms and particulars, address COMPTROLLER, Texas Agricultural and Mechanical College System, College Station, Texas.

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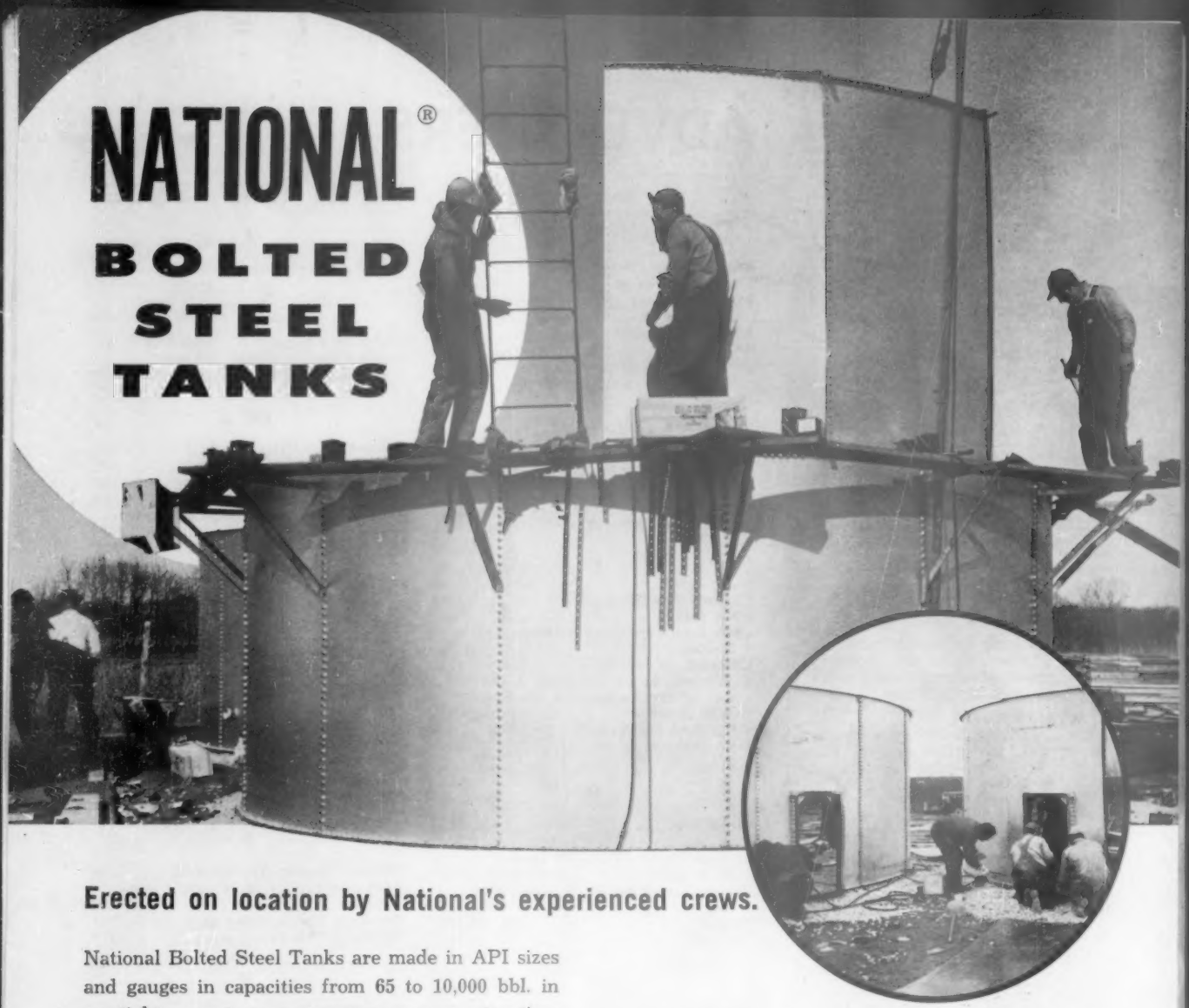
NATIONAL®
BOLTED STEEL TANKS



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National Bolted Steel Tanks are made in API sizes and gauges in capacities from 65 to 10,000 bbl. in gas-tight, open-top or vapor-pressure construction. All gasketing between staves and at bolt holes is neoprene.

National Bolted Steel Tanks are designed to be quickly and easily erected, dismantled, shipped to a new location and re-erected.

National Bolted Steel Tanks can easily be changed in diameter or height, and adapted to the storage of cement, fertilizer, chemicals, oil, water and any other liquid or granular material.

National painted tanks offer the most in low cost storage.

Galvanized-after-fabrication Tanks, a National First, offer the highest corrosion resistance to sour oils and salt water and air deterioration.

A PLUS VALUE WITH ALL NATIONAL PRODUCTS . . . Engineers and field crews living in your area in the U. S. and Canada with 55 stocked warehouses to size, install and service your National Bolted Steel Tanks.

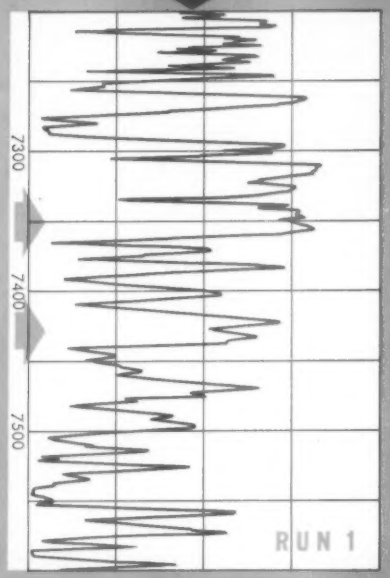
It's a National®

NATIONAL TANK COMPANY

DRAWER 1710

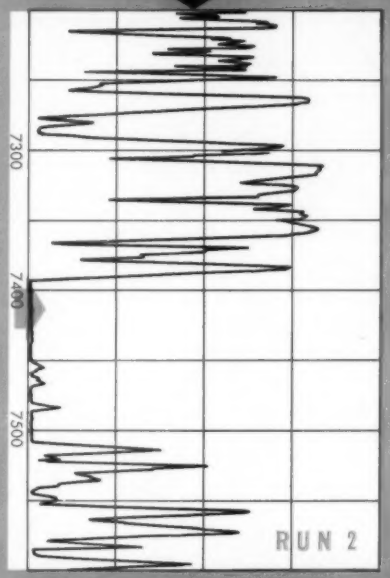
TULSA, OKLAHOMA

DOES THIS WELL NEED A SQUEEZE JOB?



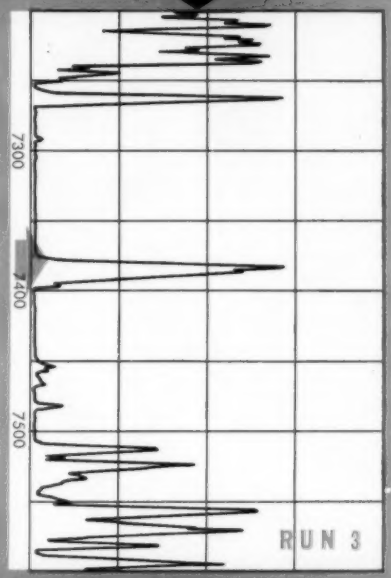
In this well, Lane-Wells Cement Bond Log showed no bonding in the zone of interest, indicated necessity of a squeeze job.

DID YOU GET AN EFFECTIVE SQUEEZE?



After perforating at 7414', well was squeezed with 88 sacks of cement. Second Cement Bond Log showed bonding from 7394' to 7510'.

DID YOU ISOLATE THE PRODUCING ZONE?



Well was perforated at 7378' and squeezed with 100 sacks of cement. Third Bond Log showed good bonding from 7269' to 7378'. Oil produced in zone from 7382' to 7390'.

Lane-Wells Acoustic Cement Bond Log

helps establish cement effectiveness with minimum equipment–without costly delays

Because it helps you "see" the cement column in a potential producing zone, Lane-Wells Acoustic Cement Bond Log is your best way to answer questions like those above. Run immediately following a primary cement job or prior to remedial operations, it can save rig time and avoid costly losses.

ACCURATE Significant information is contained in the first arrival signal, and all Lane-Wells units are equipped with an oscilloscope for viewing the acoustic signal at the receiver to assure pick of the first arrival.

ECONOMICAL More and more Lane-Wells Cement Bond Logs are now being made from single conductor equipment run from completion units, *an exclusive Lane-Wells service.* There is no delay in changing trucks. Bond log can be run immediately prior to perforating, from the same unit, or can be combined with other completion services for maximum speed at the rig. Equipment is now in service in 3⅝" size, and the 2" tool is becoming available in many areas.

Ask your Lane-Wells representative for further information on this time and money saving service.

LANE-WELLS CO.
P. O. BOX 1407 HOUSTON 1, TEXAS
DRESSER INDUSTRIES, INC.
OIL · GAS · CHEMICAL · ELECTRONIC · INDUSTRIAL

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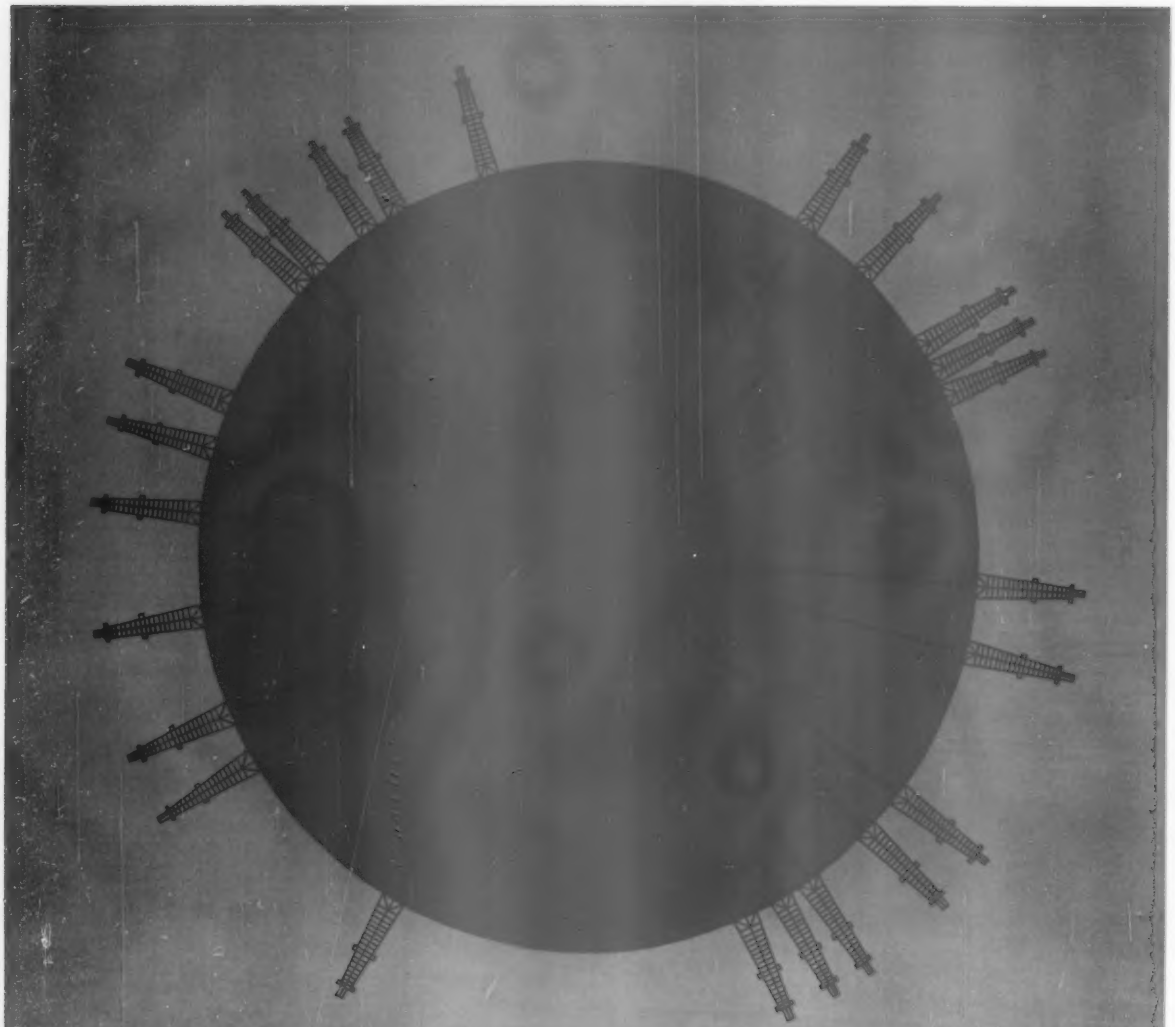

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